Parcel A - Phase II Soil Characterization
McDonnell Douglas Realty Company
C-6 Facility
Los Angeles, California

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PARCEL A - PHASE II SOIL CHARACTERIZATION
MCDONNELL DOUGLAS REALTY COMPANY C-6 FACILITY
LOS ANGELES, CALIFORNIA

EXECUTIVE SUMMARY

This report discusses the Phase II Soil Characterization for Parcel A of the McDonnell Douglas Realty Company (MDRC) C-6 Facility (Facility) located in Los Angeles, California. The characterization was completed under the oversight of the Los Angeles Region of the Regional Water Quality Control Board (RWQCB) as the lead agency, with input from the Department of Toxic Substance Control (DTSC). The Parcel A report is one of a series of reports that will cover the Facility. The report sections include:

1.0 Introduction

Section 1.0 describes Parcel A and discusses the purpose of the investigation.

2.0 Parcel A Description

Section 2.0 provides a brief history of the Facility, with particular emphasis on Parcel A. Hydrogeologic setting is summarized, based on published reports and previous work, and geologic units identified from the Phase II Soil Characterization are described.

3.0 Program Design

Section 3.0 presents a detailed description of the soil characterization program. It discusses the historical use of each area of Parcel A and explains the rationale used in determining the analytical program.

4.0 Soil Sampling and Analytical Methods

Section 4.0 describes the soil sampling program, including drilling, sampling and analytical methodology, chain of custody, and QA/QC program.

5.0 Investigation Results

Section 5.0 discusses the results from each area and presents findings in tables and figures. The complete laboratory reports are provided in appendices to the report.

6.0 Conclusions

Section 6.0 summarizes the conclusions resulting from the investigation.

7.0 References Cited

Section 7.0 presents a list of references cited throughout the report.

PURPOSE

The purpose of the Phase II Soil Characterization of Parcel A was to characterize the nature of the soils and to identify areas of concern. These data will provide support to develop a risk assessment, to plan future groundwater investigations, and for future feasibility studies and possible soil remediation. The soil characterization included the

physical properties of the soils, the subsurface distribution of the soil types, and the nature and extent of any chemicals of concern (COCs) within the soils.

LOCATION AND DESCRIPTION OF PARCEL A

The Facility is located at 19503 South Normandie Avenue in Los Angeles, California (Figure 1). The Facility is bordered on the north by West 190th Street, on the east by railroad tracks and South Normandie Avenue, on the south by Montrose Chemical and residential properties, and on the west by Western Avenue, Capitol Metals, and International Light Metals (ILM).

Parcel A occupies approximately 50 acres in the northern portion of the Facility and is bordered on the north by West 190th Street, on the east by railroad tracks and South Normandie Avenue, on the south by Buildings 1, 2, and 66, and on the west by ILM (Figure 2).

For convenience in this soil characterization, Parcel A was subdivided into five areas: 1) Area 1, 2) Area 1A, 3) Supplemental Area Northwest, 4) Supplemental Area Central, and 5) Supplemental Area Northeast. These areas were further divided into areas of potential concern, each of which was investigated individually.

GEOLOGY AND HYDROGEOLOGY

Hydrogeologic setting of the Facility was determined mainly from reference to reports published by the U.S. Geological Survey and the California Department of Water Resources. The Facility is at about 50 feet mean sea level (MSL) elevation on the Torrance Plain, a Pleistocene-age marine surface. Near-surface sediments underlying the Facility are assigned to the Lakewood Formation and include marine and continental deposits of late Pleistocene age. Aquifers underlying the Facility include the Semiperched and Gage Aquifers within the Lakewood Formation and the Lynwood and Silverado Aquifers in the deeper San Pedro Formation. Previous groundwater investigations and monitoring at the Facility established that the uppermost groundwater

is at 60 to 70 feet depth in the Semiperched Aquifer, with a hydraulic gradient to the south-southeast, measured at 3.5 feet per mile in late 1996.

Fifteen continuous core borings were drilled throughout the Facility and seven are located in Parcel A (Figure 1A). Extensive information regarding the soils within 50 feet below the ground surface (bgs) at the Facility was developed from the drilling and geologic logging in the Phase II Soil Characterization. Four distinct subsurface units were identified (Q1 through Q4). Three of these soil units correlated over the entire Facility (Q1, Q2, and Q3), while the fourth (Q4) pinches out on the northwest and dips below the depth drilled on the east. The uppermost soils at the Facility consist predominantly of clay and silt. These fine-grained soils are present to about 22 feet bgs on the west and thicken to about 45 feet on the east. Unit Q4 is not present in the subsurface soils of Parcel A. Soils below these depths are predominantly sand and silty sand to the 50-foot maximum depth drilled.

FIELD PROGRAM

A Field Sampling Plan was developed based on the findings of the Phase I environmental site assessments of the Facility. The Plan identified the individual areas of potential concern and reviewed the history of the areas. Based on these data, specific analytical testing was proposed at each location. The Plan was reviewed and approved by the RWQCB and DTSC.

One hundred eight soil borings were drilled and approximately 550 soil samples were collected for analysis in the five areas investigated for the Phase II Soil Characterization of Parcel A. The soil borings were drilled with either direct hydraulic-push or hollow-stem auger drilling methods. Borings to 10 feet and 25 feet bgs were drilled and sampled by direct-push methods. Borings to 50 feet bgs were drilled by hollow-stem auger.

All soil samples were analyzed for volatile organic compounds (VOC) and total recoverable petroleum hydrocarbons (TRPH) by EPA Methods 8260 and/or 8010/8020,

and 418.1, respectively. Selected additional analyses were performed on an area-by-area basis and include Title 22 metals, including hexavalent chromium (EPA Methods 6010, 7196, and 7471), polychlorinated biphenyls (PCB) (EPA Method 8080), pesticides (EPA Method 8080), cyanide (EPA Method 9010), pH (EPA Method 9045), and radioisotopes (EPA Methods 900.0 and 901.1). Most of the samples were first analyzed on site for VOCs and TRPH by state-certified mobile laboratories. If these initial analyses indicated concentrations exceeding 200 micrograms/kilogram (μg/kg), the samples were also analyzed in a state-certified stationary laboratory for confirmation. As an additional quality assurance (QA) check, the offsite stationary laboratory also analyzed 10 percent of the samples for which the mobile laboratory reported VOCs and TRPH as not detected.

AREAS OF CONCERN

Four of the areas of potential concern were found to contain COCs at levels such that they were designated areas of concern.

- Building 36
- Building 66-1 washdown
- Borings 1-27 and 1-27A (located north of Building/Area 45)
- Borings SA-NE-14 and SA-NE-17 (located north of Building/Area 45 and east of Building 41).

Each of these are described in the following paragraphs:

Building 36 (Supplemental Area Central)

Building 36 formerly was a paint and solvent storage area, and previous investigations conducted during the removal of the USTs reported VOCs in the underlying soils. As expected, the Phase II Soil Characterization detected trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), 2-butanone (MEK), and other VOCs in samples from borings at Building 36. These VOCs related to a past, onsite release of COCs.

The 20-foot sample from boring 36-13 contained the highest concentration of chlorinated hydrocarbons: 6,300 µg/kg 1,1-DCA; 5,400 µg/kg 1,1-DCE; 1,600 µg/kg cis-1,2-DCE; 33,000 µg/kg 1,1,1-TCA; and 97,000 µg/kg TCE. Concentrations of these compounds were lower in the samples above and below 20 feet, but VOCs were detected to the 50-foot maximum depth of the boring. VOC detections at 50 feet bgs in boring 36-13 were 1,1-DCA (140 µg/kg), 1,1-DCE (140 µg/kg), and TCE (550 µg/kg).

The 20-foot sample from boring 36-13 also contained the highest concentrations of aromatic hydrocarbons: 1,200 µg/kg benzene; 370,000 µg/kg ethylbenzene; 3,700,000 µg/kg toluene; 2,300,000 µg/kg m,p-xylenes; and 690,000 µg/kg o-xylenes. These aromatic hydrocarbons decreased greatly in the deeper samples; only toluene (5,900 µg/kg) and m,p-xylenes (180 µg/kg) were detected in the 50-foot sample. These aromatic compounds are very limited in lateral extent.

The subsurface distribution of these COCs somewhat reflects a relationship with the underlying soil units. The concentrations are highest and the lateral distribution widest around 20 to 40 feet bgs, possibly related to soil changes from primarily clay to primarily silts and even to sand at the deeper depths. It appears the COCs tend to spread out near the change in soil units.

Although the COCs have high concentrations in the Building 36 area, the lateral extent of concentrations greater than 500 µg/kg is generally limited to the area along the western side of Building 36 and north to the southern end of Building 37.

Building 66-1 Washdown (Area 1)

TCE, ethylbenzene, xylenes, and other VOCs were detected in the 1-foot samples from borings at this location. These affected soils are limited in depth, as these compounds were not detected in samples deeper than 1 foot bgs. The highest concentrations were at boring 1-13, where TCE was reported at 210,000 µg/kg. The impacted soils are probably related to washdown procedures used at the Facility.

Borings 1-27 and 1-27A (Area 1)

Borings 1-27 and 1-27A are in the northeastern part of the open space in Area 1. Lead was detected in two samples from these borings: at 1 foot in boring 1-27 (72 milligrams/ kilogram [mg/kg]) and at 4 feet in boring 1-27A (8 mg/kg). Both samples were well below the Total Threshold Limit Concentration (TTLC) of 1,000 mg/kg, but the sample from boring 1-27 exceeds 10 times the 5.0 mg/L Soluble Threshold Limit Concentration (STLC). Lead was not detected in the deeper samples.

Borings SA-NE-14 and SA-NE-17 (Supplemental Area Northeast)

Borings SA-NE-14 and SA-NE-17 are in the southern part of the open space in Supplemental Area Northeast. Petroleum hydrocarbons were detected in the shallow soils at these borings. The sample from 6 feet bgs in boring SA-NE-14 contained 13,000 µg/kg TPH as gasoline and 1,200 mg/kg TRPH, 68 mg/kg TPH as diesel, and 33 mg/kg TPH as motor oil, along with 56 µg/kg TCE. TRPH concentrations were 110 mg/kg and TPH as diesel was 700 mg/kg in the 10-foot sample, and were not detected below 10 feet. Impacted soils at these two sampling locations are in the vicinity of a recently discovered pipeline that may lead from the ASTs in the northwest corner of the Facility to the boilers in Building 41.

AREA 1A

In addition to the four areas described above, TCE was detected at various depths in 21 of the 53 samples collected along the border with ILM. Concentrations ranged from 5.0 to 60 µg/kg. There is no indication of an onsite source of the TCE in this area. Published documents from investigations conducted at ILM strongly suggest the TCE detections could be related to soil conditions immediately west at ILM.

1.0 INTRODUCTION

Kennedy/Jenks Consultants performed a Phase II Soil Characterization of the McDonnell Douglas Realty Company (MDRC) C-6 Facility (Facility) under Contract No. 97-007TO, dated 21 February 1997. A Field Sampling Plan (FSP) was prepared for the soil characterization and reviewed and approved by the Regional Water Quality Control Board, Los Angeles Region (RWQCB), the lead agency; the Department of Toxic Substance Control (DTSC); and the Office of Scientific Affairs (OSA).

This section provides a description of the general location of the Facility and Parcel A of the Facility. The Section also presents the purpose of the Phase II Soil Characterization program.

1.1 C-6 Facility Location

The Facility is approximately 170 acres, located at 19503 South Normandie Avenue in Los Angeles, California (Figure 1). The Facility is bordered on the north by West 190th Street, on the east by railroad tracks and South Normandie Avenue, on the south by Montrose Chemical and residential properties, and on the west by Western Avenue, Capitol Metals, and International Light Metals (ILM).

Parcel A of the Facility occupies approximately 50 acres of the northern portion of the Facility and is bordered on the north by West 190th Street, on the east by railroad tracks and South Normandie Avenue, on the south by Buildings 1, 2 and 66, and on the west by ILM (Figure 1). Parcel A is comprised of five areas of investigation designated as Area 1, Area 1A, Supplemental Area Northwest, Supplemental Area Central, and Supplemental Area Northeast (Figure 2). These areas are further described in Section 3.1.

1.2 Purpose

The purpose of the Phase II Soil Characterization was to identify and characterize the nature of the soils above groundwater, potential areas of concern throughout the

Facility, including Parcel A, and to support the ongoing risk assessment. The soil characterization included the physical properties of the soils, the subsurface distribution of the soil types, and the nature and extent of Chemicals of Concern (COCs) within the soils.

2.0 PARCEL A DESCRIPTION

This section provides a history of the Facility and a description of Parcel A and its subdivisions. This section also presents a discussion of the regional and local geology and hydrogeology.

2.1 Description and History of Areas of Investigation

A review of aerial photographs indicated that the Facility was farmland prior to the 1940s (Kennedy/Jenks Consultants, March 1996). The Facility was first developed by the Defense Plant Corporation in 1941, as part of an aluminum reduction plant. The plant was operated by the Aluminum Company of America until late 1944 (Camp, Dresser & McKee, 1991). In 1948, the property was acquired by the Columbia Steel Company. In March 1952, the U.S. Navy purchased the property from the Columbia Steel Company and established Douglas Aircraft Company (DAC) as the contractor and operator of the Facility for the manufacturing of aircraft and aircraft parts. DAC purchased the Facility from the Navy in 1970 (Camp, Dresser & McKee, 1991). The Facility was transferred to MDRC in 1996.

Topography in Parcel A, the northern portion of the Facility (Figure 1), is essentially flat with an elevation of approximately 50 feet above mean sea level (MSL). Manufacturing operations located in Parcel A have been inactive for approximately the last four years. The manufacturing equipment was removed and most of the buildings were demolished prior to the start of this investigation.

Parcel A was divided into five areas for this investigation and includes Area 1, Area 1A, Supplemental Area Northwest, Supplemental Area Central, and Supplemental Area Northeast (Figure 2). Each area was then investigated based on potential areas of concern and to support the ongoing risk assessment. The discussions that follow focus on the general uses of each area. Section 3.0 discusses the historical use of each building within each area, based on earlier Phase I environmental site assessments conducted by Kennedy/Jenks Consultants in March 1996.

2.1.1 Area 1

Area 1 occupies approximately 6 acres of the southeast portion of Parcel A. Facility operations conducted in this area were numerous and resulted in various potential areas of concern that were investigated, including Buildings 40, 41, and 66-1, the area around Building/Area 45, the Chrome Recovery System Area, a Chemical Etching Area, and open space (Figure 2).

2.1.2 Area 1A

Area 1A occupies approximately 20 acres of the northwest portion of Parcel A and has been a parking lot throughout the history of the Facility. The area is of special interest because it contains a railroad spur and borders ILM on the west (Figure 2). Area 1A is bordered by West 190th Street on the north, and Supplemental Areas Northwest and Central and Buildings 1, 2, and 66 on the east and south.

2.1.3 Supplemental Area Northwest

Supplemental Area Northwest occupies approximately 11 acres of the north-central portion of Parcel A and is bordered by West 190th Street on the north, Supplemental Area Central on the east and south, and Area 1A on the west (Figure 2). The area previously contained storage and minor process buildings (Buildings 34, 61, 57, and 67) that were removed prior to this investigation.

2.1.4 Supplemental Area Central

Supplemental Area Central occupies approximately 7 acres of the north-central portion of Parcel A and is an L-shaped area bordered on the north by West 190th Street and Supplemental Area Northwest, on the east by Supplemental Area Northeast, on the south by Area 1 and Building 1, and on the west by Area 1A and Supplemental Area Northwest (Figure 2).

There are three areas of potential concern within Supplemental Area Central and include Building 37, which contained numerous below-grade concrete containments for large manufacturing equipment. This building was first investigated in 1996, and the results were presented in a report titled Phase II Subsurface Investigation, Douglas Aircraft Company C-6 Facility, Parcel A (Kennedy/Jenks Consultants, June 1996). The building was removed prior to this investigation and the footprint of the building has been remediated, including soil excavation, removal, and recompaction, and is documented in reports prepared by Montgomery-Watson (1997a and 1997b).

Supplemental Area Central also includes the area of a small concrete pad, investigated during the 1996 investigation (Kennedy/Jenks Consultants, June 1996), and was found to have volatile organic compounds (VOCs) in the subsoil. This area was further investigated and the results presented in a report titled Supplemental Phase II Subsurface Investigation, Douglas Aircraft Company C-6 Facility, Parcel A (Kennedy/Jenks Consultants, August 1996).

Supplemental Area Central also contains Building 36 (Figure 2), a former chemical storage area that contained both ASTs and underground storage tanks (USTs). The area of Building 36 was known to have VOCs in the soil from previous investigations conducted during the removal of the tanks.

2.1.5 Supplemental Area Northeast

Supplemental Area Northeast includes approximately 6 acres of the northeasternmost corner of Parcel A and is bordered on the north by West 190th Street, on the east by railroad tracks and South Normandie Avenue, on the south by Area 1, and on the west by Supplemental Area Central (Figure 2). This area includes two existing large-volume (~50,000 gallon) ASTs that originally contained diesel fuel and presently contain water for the Facility fire protection system. Supplemental Area Northeast is believed to contain pipelines associated with the distribution system to transport the diesel fuel to Building 41, the boiler building in Area 1, and railroad tracks. The remainder of this area is unpaved open space.

2.2 Regional Geology And Hydrogeology

The geology and hydrogeology of the region surrounding the Facility were determined mainly from reference to reports published by the U.S. Geological Survey (USGS) (Poland and others, 1959) and the California Department of Water Resources (DWR, 1961). Reference also was made to previous reports prepared by Kennedy/Jenks Consultants for the Facility.

The Facility is located on a broad plain at an elevation of about 50 feet MSL. The DWR and USGS define this area as the Torrance Plain, a Pleistocene-age marine surface and a subdivision of the Coastal Plain of Los Angeles and Orange Counties. The ground surface in this area is generally flat with an eastward gradient of about 20 feet per mile (less than one-half percent). Surface drainage is generally toward the Dominguez Channel, about a mile to the east. The Dominguez Channel, in turn, flows southeastward toward the Los Angeles and Long Beach Harbors in San Pedro Bay.

The surface sediments in this area are assigned to the Lakewood Formation (DWR, 1961), a unit defined to include essentially all of the upper Pleistocene sediments in the Los Angeles Coastal Plain area. The Lakewood Formation includes deposits of both marine and continental origin, representing stream transport and sedimentation along the Pleistocene marine plain. In the Facility area, the Lakewood Formation may include the Semiperched Aquifer, the Bellflower Aquiclude, and the Gage Aquifer. The Semiperched Aquifer includes deposits described as Terrace Cover (Poland and others, 1959). Extent and thickness of this unit is not rigorously defined, but appears to include the near-surface water-bearing units in the area of the Facility. The Bellflower Aquiclude is described as a heterogeneous mixture of continental, marine, and wind-blown sediments, mainly consisting of clays with sandy and gravelly lenses (DWR, 1961). The base of the Bellflower Aquiclude is about 100 feet below sea level (about 150 feet bgs) in the Facility area. The Gage Aquifer is a water-bearing zone of fine to medium sand and gravel confined by the Bellflower Aquiclude. It is reported to be about 40 feet thick in the Facility area and is described as being of secondary importance as a water source (DWR, 1961).

The Lakewood Formation is underlain by the Lower Pleistocene San Pedro Formation, which continues to about 1,000 feet in depth in the Facility area. Major water-bearing zones within the San Pedro Formation are the Lynwood Aquifer and the Silverado Aquifer. These are reported to be at depths of about 300 and 500 feet, respectively, in the Facility area (DWR, 1961). The Silverado is an important groundwater source in the Coastal Plain and is considered a source of drinking water (DWR, 1961).

2.3 Local Geology And Hydrogeology

2.3.1 Local Geology

The drilling program conducted during the Phase II Soil Characterization provided extensive information with regard to the sediments within the upper 50 feet at the Facility. The drilling program included 36 hollow-stem auger borings and 174 direct-push probes, totaling approximately 4,700 linear feet. The drilling program for Parcel A included 22 hollow-stem auger borings and 86 direct-push borings totaling about 2,700 linear feet. Boring locations are shown on Figure 2 and boring logs are in Appendix A.

To allow detailed examination of the subsurface soils, 15 borings at various locations within the Facility were continuously sampled from the surface to 50 feet bgs. Seven of these core borings are located in Parcel A (Figure 1A). The detailed logs from some of these borings were used to construct the generalized cross-sections for Parcel A that are presented in Figures 3 through 5. Logs from the other, shallower borings are consistent with the soil units shown on the generalized cross-sections.

Several distinctive soil units were recognized in the subsurface and can be correlated between borings, as shown on Figures 3 through 5. For convenience in this text, the subsurface soil units are informally designated Units Q1 through Q4.

Unit Q1: Unit Q1 is a layer of silty clay and sandy clay encountered at the surface or just below the pavement or engineered fill soils over the entire Facility. This clay is typically dark brown to dark reddish brown in color and medium stiff to hard. It has moderate to

high plasticity and is classified as CL or CH under the Unified Soil Classification System (USCS). Unit Q1 has a uniform thickness of about 5 feet along the west side of the Facility. It thickens to about 22 feet on the northeast corner of the Facility.

Unit Q2: Unit Q2 comprises a sequence of interbedded clayey silt, fine sandy silt, and fine silty sand with minor lenses of silty clay. The predominant USCS classifications are ML and SM. The Unit Q2 soils are brown, olive brown, and reddish brown in color and are generally medium dense. Unit Q2 is about 17 to 20 feet thick and the base is about 22 to 25 feet bgs along the west side of the Facility. The unit thickens to about 30 feet at the east side of the Facility. The base of Unit Q2 also slopes eastward, and occurs at depths of 45 to 50 feet along the east side of the Facility.

Unit Q3: Unit Q3 is an interval of fine and very fine sand with only minor silt. Soils in this interval generally are classified as SP and SP-SM under the USCS. This soil unit includes distinctive beds containing abundant shell fragments. The sand is mainly light yellowish brown to light yellowish gray in color. It has generally massive structure, and commonly is described as being similar to beach sand. The sand is generally dense, but has essentially no cohesion.

Unit Q3 is more than 28 feet thick on the west side of the Facility, extending from about 22 feet bgs to below the 50-foot depth drilled at the northwest corner of the Facility. However, in the southern part of the Facility, Unit Q3 is interlayered with Unit Q4, a wedge of fine silty sand and fine sandy silt.

Unit Q4: Unit Q4 was observed in borings in the southwestern and central part of the Facility. It pinches out in the northwestern part of the area and is likely below the depth drilled on the east. Maximum thickness of this soil unit is about 17 feet, on the southwest. This unit is not present in Parcel A. Unit Q4 mainly contains fine silty sand (SM) and clayey silt (ML) with thin interbeds of silty clay and fine sand. These soils are generally yellowish brown in color and are medium dense to dense.

2.3.2 Local Hydrogeology

Groundwater conditions at the Facility are known from previous investigations and from the quarterly groundwater monitoring program (Kennedy/Jenks Consultants, 1997). Groundwater samples from 15 observation wells at the Facility have been sampled and analyzed on a quarterly basis since 1992. The drilling for the Phase II Soil Characterization was entirely in the unsaturated zone and did not provide additional information on groundwater.

The uppermost groundwater at the Facility appears to be under water-table conditions at depths of 60 to 70 feet. Regionally, this uppermost groundwater is probably considered part of the Semiperched Aquifer discussed previously and is separated from the deeper zones by the Bellflower Aquiclude.

Monitoring wells at the Facility are completed in two zones. Most of the wells are completed at or near the water table, at depths of about 55 to 90 feet. Two deeper wells, WCC-1D and WCC-3D, are completed in a deeper zone at about 115 to 140 feet.

Complete records of water-level measurements are included in the quarterly Groundwater Monitoring Summary Reports (Kennedy/Jenks Consultants, January 1997). The hydraulic gradient in the uppermost groundwater is generally toward the south-southeast, toward a local low in the area of wells WCC-7S and WCC-12S. The December 1996 groundwater gradient was 6.6×10^{-6} ft/ft (3.5 ft/mile).

3.0 PROGRAM DESIGN

This section provides the details of the Phase II Soil Characterization program design, the rationale for soil boring placement, and analytical testing on an area-by-area and building-by-building basis.

3.1 Program Design

The soil sampling program was designed to detect COCs throughout the Facility and, as such, is conservative throughout. Additional samples and/or analyses were added to the program, where appropriate, to provide high confidence that COCs would be adequately characterized. As described in Section 2.1, Parcel A is diverse and contains portions of complex industrial processes and portions that have been parking lots throughout the history of the Facility. Soil sampling locations were placed in areas of known processes, chemical storage areas, and previously identified potential areas of concern. Additional soil borings were placed on a sampling grid with various spacing to cover open areas and border areas of particular interest.

To best describe the subsurface soils, soil borings were completed to three different depths: 10 feet, 25 feet, and 50 feet bgs. The 10-foot and 25-foot soil borings were completed by direct-push technology and the 50-foot soil borings were completed by hollow-stem auger. Further detail of the drilling methodologies is presented in Section 4.1. Detailed geologic boring logs were made of each soil boring and are presented in Appendix A. All Push borings were continuously cored in their upper 10 feet. A total of fifteen 50-foot soil borings were continuously cored to total depth to provide detailed soils data across the Facility, in addition to the analytical testing.

Field activities were initiated with selection of sampling locations, geophysical screening for underground obstructions, and coring of concrete paving to access subsurface soils. Additional geophysical screening and concrete coring were conducted during the drilling program when new borehole locations were added to the investigation.

Soil samples were collected from 1 foot, 4 feet, and 10 feet bgs in all borings. Where possible, the uppermost soil sample was collected from 6 inches bgs; however, in many instances a 6-inch sample was impractical due to either the deteriorated asphalt at the surface, fill, base materials for concrete, railroad ballast, or because the surface had been disturbed by building demolition. Soil samples were collected at 5-foot intervals below 10 feet depth in borings drilled to 25 feet bgs and on 10-foot intervals below 10 feet depth in 50 foot boreholes.

The program had one to three drilling rigs collecting soil samples each day and was designed to process approximately 50 to 60 soil samples per day.

Blank samples and confirmation analyses were used for QA in the field program. Daily rinsate blanks were used to check decontamination of sampling equipment. Daily travel blanks accompanied all samples shipped to the stationary laboratory. Ten percent of the samples showing non-detect results for EPA Methods 8260 and 418.1 from the onsite mobile laboratories were sent to the stationary laboratory for confirmatory analysis. And, EPA Method 8260 mobile, onsite laboratory results exceeding 200 micrograms per kilogram (μg/kg) total VOCs were also sent to the stationary laboratory for confirmation analysis. Split soil samples were also collected by the RQWCB at selected sampling locations. Original laboratory reports are presented in Appendix B.

3.1.1 Sample Identification

Soil samples were identified with a unique boring number and depth using a predetermined nomenclature. For the Parcel A Soil Characterization, an example identification code is:

2BB-1-5-10

Where

2BB-	study designation
1-	area designation
5-	boring number in that area
10	nominal sample depth.

3.2 Rationale for Sampling Locations and Analytical Testing

The rationale for the sampling locations and analytical testing that follows is based on any of the following factors:

- The locations of known past processes that used specific chemicals.
- The location of specific equipment of concern, such as electrical transformers, clarifiers, ASTs, USTs, and others.
- Areas of Parcel A that border areas of known or suspected contamination.
- Soil samples were also collected and analyzed from areas having no prior history of concern to provide a comprehensive data base on Facility soil conditions for use in the risk assessment.

Sampling locations are shown on Figure 2. The following discussion presents a summary of sampling locations and analytical testing for the Areas within Parcel A. Table 1 presents the overall soil sampling analytical program for Parcel A.

3.2.1 Area 1

3.2.1.1 Building 40

Building 40 was formerly used as a chemical storage area. Information on specific chemicals was not available. Currently, the building is used to store various types of supplies and equipment. Drums of lubricant and hydraulic oil are located within a concrete containment area in the middle of the building.

Three soil borings (1-1, 1-1A, and 1-2) were pushed in Building 40 beneath the concrete floor (Figure 2). Borings 1-1A and 1-2 were pushed to 10 feet bgs on the south and north sides of the containment area, respectively. Boring 1-1 was pushed to 25 feet bgs

within the containment area. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), semivolatile organic compounds (SVOCs) (8270), and Title 22 metals (6010, 7196, and 7471).

3.2.1.2 Building 41

Building 41 was formerly the boiler house. The boilers were fueled by diesel. One boiler remains in place but is not in operation. The building also contained air compressors and a floor drain. Clarifiers were located outside the building on the north and the south. The area around the building is known from previous studies to contain hydrocarbons in the soils. Building 41 is near Building 36 to the northwest, an area of known VOC contamination, and borders a chemical etching process area to the southwest.

One boring, 1-3, was placed in Building 41 and three borings were placed around the outside of the building on the north (1-4), east (1-5), and south (1-6) (Figure 2). Boring 1-3 was pushed to 10 feet bgs. Borings 1-4, 1-5, and 1-6 were drilled to 50 feet bgs by hollow stem auger. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), and Title 22 metals (6010, 7196, and 7471).

3.2.1.3 Building/Area 45

Building 45 is a concrete containment area located under a canopy. The concrete containment area was built between 1986 and 1989 and was used as a hazardous waste accumulation area. Hazardous wastes were picked up from this area and removed from the Facility. Cyanide was also formerly stored in this area.

Five soil borings (1-7 through 1-11) were drilled in and around Building/Area 45 (Figure 2). All five borings were pushed to 10 feet bgs. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or

8010/8820), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), Title 22 metals (6010, 7196 and 7471), and cyanide (9010).

3.2.1.4 Building 66-1 Area

Building 66-1 is a wood-frame building that served as a shipping office. Outside the building to the northwest is a heavily stained wash down area with an underground sludge tank. The heavily stained area was investigated to determine the nature of the stains.

Six soil borings (1-12,1-13, and 1-34 through 1-37) were drilled around the wash down area (Figure 2). Borings 1-12, and 1-34 through 1-37 were pushed to 10 feet bgs. Boring 1-13 reached refusal at 2.5 feet bgs. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), Title 22 metals (6010, 7196, and 7471), and cyanide (9010).

3.2.1.5 Chrome Recovery System Area (CRS)

This Area was historically used for recovery of chromium from Facility processes. All process equipment has been removed and only secondary containment berms are present. The area also borders the chemical etching area to the north.

Six soil borings (1-14 through 1-18 and 1-38) were drilled in and around the CRS area (Figure 2). Borings 1-14 through 1-18 were pushed to 25 feet bgs, and boring 1-38 was drilled to 50 feet bgs by hollow-stem auger. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and pH (9045).

3.2.1.6 Chemical Etching Area

The area was used for chemical etching of parts and includes two areas of process equipment. The area is located outside of the northeast portion of Building 1 and is covered with a roof but has open sides.

Four soil borings (1-19 through 1-22) were drilled in the chemical etching area (Figure 2). All borings were pushed to 25 feet bgs. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), Title 22 metals (6010, 7196, and 7471), and pH (9045).

3.2.1.7 Area Southeast of Building 41

This area is essentially open space between Building 41 and Building/Area 45. It is an area of known, deep petroleum hydrocarbon and VOC contamination, and locations were chosen to determine the potential southeastern extent of COCs.

Four soil borings (1-23 through 1-26) were drilled in the area extending southeast from Building 41 to the Building/Area 45. All four borings were drilled to 50 feet bgs by hollow stem auger. Soil boring 1-26 was continuously cored to total depth. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and cyanide (9010). Representative soil samples of the three main soil units (Q1, Q2, and Q3) were collected from boring 1-26 and were tested for total organic content, cation exchange, moisture content, bulk density, particle-size distribution, intrinsic porosity, and effective porosity.

3.2.1.8 Open Space

Because of the many chemical storage areas and processes used areas throughout Area 1, the remaining open space was investigated to provide information on the distribution of potential COCs throughout the area to provide support for the ongoing risk assessment.

Nine soil borings (1-27, 1-27A, 1-27B, and 1-28 through 1-33) were located throughout the open space, including two borings east of Building 41 and north of Area 45, one boring east of Area 45, and two borings between the CRS and the Chemical Etching Area on the west, and Building/Area 45 and Building 66-1 on the east (Figure 2). All borings were pushed to 10 feet bgs. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), and Title 22 metals (6010, 7196, and 7471).

3.2.2 Area 1A

3.2.2.1 Border with Industrial Light Metals

The area borders ILM to the west, an area of known soil and groundwater contamination. Railroad tracks are located along the border on the west and north.

Eight soil borings (1A-1 through 1A-5, 1A-5A , 1A-6 and 1A-7) were drilled along the railroad tracks on the northwestern border of Parcel A and ILM (Figure 2). All eight borings were drilled to 50 feet bgs by hollow-stem auger. Soil boring 1A-5A was continuously cored to total depth. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and PCBs (8080). Representative soil samples of the three main soil units (Q1, Q2, and Q3) were collected from boring 1A-5A were also tested for total organic content, cation exchange, moisture content, bulk density, particle-size distribution, intrinsic porosity, and effective porosity. This additional testing was done to provide soil properties relating to transport of COCs for the ongoing risk assessment and potential future soil remediation projects.

3.2.2.2 Open Space

This area includes most of Area 1A and has historically been primarily a parking lot with minor storage of building and office materials.

Eleven soil borings (1A-8 through 1A-19) were drilled throughout the area on approximately 200 to 300 foot spacings (Figure 2). Borings 1A-8 through 1A-16 and 1A-18 and 1A-19 were pushed to 25 feet bgs. Boring 1A-17 was drilled to 50 feet bgs by hollow-stem auger and continuously cored to total depth. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and PCBs (8080). Representative soil samples from boring 1A-17 were also tested for total organic content, cation exchange, moisture content, bulk density, particle-size distribution, intrinsic porosity and effective porosity. This additional testing was done to provide soil properties relating to transport of COC for the ongoing risk assessment.

3.2.3 Supplemental Area Northwest

3.2.3.1 Area of Buildings 67, 57, 61, and 34

Building 34 was historically the commissary and was converted to a machine shop. Building 57 was historically used for parts storage and contains no manufacturing. Building 61 was historically used for plastic parts manufacturing and contained paint booths and hydraulic lifts. Building 67 historically included a high-voltage electric discharge machine to remove burrs from aircraft parts, a treatment process line with acids and solvents, a chemical storage area, x-ray booths, and an air compressor room. The buildings were specifically sampled for the areas of concern in a previous investigation (Kennedy/Jenks Consultants, June 1996). The buildings were removed from the Facility and additional sampling was necessary to provide confirmatory sampling after demolition and to support the ongoing risk assessment.

Thirteen soil borings (SA-NW-1 through SA-NW-13) were drilled in the Supplemental Area Northwest (Figure 2). Borings SA-NW-1 through SA-NW-6 and SW-NW-8 through SA-NW-12 were pushed to 10 feet bgs. Boring SA-NW-7 was drilled to 50 feet bgs by hollow-stem auger. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and pH (9045). Soil samples from boring SA-NW-1 were also tested for SVOCs (8270) and PCBs (8080). Soil samples from boring SA-NW-13, collected from the area of the former X-ray booth, were only tested for radioisotopes (900.0 and 901.1).

3.2.4 Supplemental Area Central

3.2.4.1 Building 36 Area

Building 36 was formerly a paint and solvent storage area and had USTs and above-ground storage of solvents in and around the building.

Seventeen soil borings (36-1 through 36-17) were drilled around Building 36. Borings 36-1 through 36-12 were pushed to 25 feet bgs (Figure 2). Two borings, 36-13 and 36-14, were drilled to 50 feet bgs by hollow-stem auger. Boring 36-5 was located directly over the southern portion of Building 36 and reached refusal at 10 feet bgs because of concrete debris in the soils. Borings 36-9 through 36-12 were pushed inside Building 1, located immediately south of Building 36. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020) and petroleum hydrocarbons (418.1 and 8015M).

3.2.4.2 Open Space

The open space portions of Supplemental Area Central were not specifically sampled for this investigation. They include the area of Building 37, which has recently been remediated by Montgomery-Watson, including excavation, removal and recompaction, and was previously investigated in June 1996 (Kennedy/Jenks Consultants, June 1996).

A small area, Concrete Pad 15, located in the northern arm of Supplemental Area Central, was previously investigated by Kennedy/Jenks Consultants, and the results presented in reports from June and August 1996. No new soil borings were completed in this open space.

3.2.5 Supplemental Area Northeast

3.2.5.1 Diesel Fuel Line

This area contains a suspected shallow buried pipeline that reportedly transferred diesel fuel from the large tanks on the northeast corner of the Facility to Building 41 to fuel the boilers in Building 41.

Four soil borings (SA-NE-1 through SA-NE-4) were drilled along the approximated path of the pipeline from two large ASTs to Building 41 (Figure 2). Borings SA-NE-1, SA-NE-3, and SA-NE-4 were pushed to 25 feet bgs and boring SA-NE-2 was drilled to 50 feet bgs by hollow-stem auger. Soil samples were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), and SVOCs (8270).

3.2.5.2 Open Space

This area includes the northeasternmost portion of the Facility and is topographically a low area that has been historically unpaved. The area surrounds the aboveground water tanks that reportedly contained diesel fuel in the past and borders a rail spur to the east.

Thirteen soil borings (SA-NE-5 through SA-NE-17) were drilled in the northeast unpaved area (Figure 2). Boring SA-NE-16 was pushed to 10 feet bgs to investigate a small low area containing plastic sheeting. Borings SA-NE-5 through SA-NE-7, SA-NE-9 through SA-NE-15, and SA-NE-17 were pushed to 25 feet bgs. Soil boring SA-NE-8 was drilled to 50 feet bgs by hollow-stem auger and continuously cored to total depth. Soil samples

were collected according to the depth scheme presented in Table 1 and sampled for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), and Title 22 metals (6010, 7196, and 7471). Representative soil samples from boring SA-NE-8 were also tested for total organic content, cation exchange, moisture content, bulk density, particle-size distribution, intrinsic porosity, and effective porosity. This additional testing was done to provide soil properties relating to transport of COC for the ongoing risk assessment.

4.0 SOIL SAMPLING AND ANALYTICAL METHODS

This section provides the details of the borehole drilling and sampling methods, sample handling and the sample analytical program including QA/QC. Over 550 samples were collected in the field. The field work was conducted during the period from 27 February through 11 March 1997, and 1 April through 7 May 1997. Parcel A soil sampling locations are illustrated on Figure 2.

To accomplish the Phase II Soil Characterization objectives and document proper protocol for the work, a Field Sampling Plan (FSP) was prepared and reviewed with field staff prior to initiating field work. Following the FSP, drilling and sampling methods were conducted in accordance with Kennedy/Jenks Consultants' Standard Operating Guides included in Appendix C. The Guides incorporate industry professional standards for routine sampling, and are designed to meet general regulatory agency requirements and result in litigation-quality work. A Site Health and Safety Plan was also prepared and reviewed with field staff prior to conducting field activities. Field safety meetings were conducted with Kennedy/Jenks Consultants and subcontractor staff at the beginning of each day to review physical and chemical hazards and emergency procedures related to the work.

4.1 Drilling and Soil Sampling

Field activities were initiated with selection of sampling locations, geophysical screening for underground obstructions, and coring of concrete paving to access subsurface soils. Several planned drilling locations as presented to the RQWCB and DTSC in the FSP were moved due to potential underground structures such as pipelines, utility lines, and vaults. The revised plan was approved by the RWQCB and DTSC. Additional geophysical screening and concrete coring were conducted during the drilling program when new borehole locations were added to the investigation.

Sampling was accomplished using direct-push (Geoprobe/Earthprobe), limited access direct-push (XD-1), and hollow-stem auger (CME-85) drilling methods. Direct-push drilling was used on all 10-foot and 25-foot soil borings. The push technology uses a

truck-mounted or portable hydraulically driven sampler or core barrel that allows penetration and standard sampling without the generation of drill cuttings. The sampler for the push tool was fitted with 2-foot-long, 1-inch-diameter Tenite sleeves. No residuals were generated using this equipment. The boreholes were backfilled with a cement-bentonite grout and the surface capped with original material (e.g., concrete, asphalt or native soil). A total of 86 borings throughout Parcel A were drilled and sampled using this equipment.

A CME-85 hollow-stem auger drilling rig was used to drill and sample the 50-foot soil borings. Sampling was conducted using a standard split-spoon sampler fitted with 2 1/2-inch-diameter, 6-inch-long brass sleeves. Cuttings from these borings were drummed and the holes were backfilled with a cement-bentonite grout and the surface capped with original material. A total of 22 borings throughout Parcel A were drilled and sampled using this technique.

At each of the soil sampling locations, the soil types encountered were logged using the standard Unified Soil Classification System (USCS) and Munsell Color Chart notation. Boring logs are included in Appendix A.

Soil cuttings from hollow-stem auger boreholes were labeled, inventoried, and stored in drums at the Facility for later disposal.

4.2 Sample Handling

Soil samples were collected in Tenite, stainless steel, or brass sleeves and then covered with Teflon™ sheets, capped, labeled, and temporarily stored in ice-cooled containers. For each sampling interval, two or three sleeves (depending on length) were collected for laboratory analysis, one for each of the two mobile laboratories on location and one for the offsite laboratory. Samples were identified with the boring number and depth using the predetermined nomenclature presented in Section 3.1.1.

Samples were immediately labeled, placed in ice-cooled, insulated containers upon collection and transported to the onsite mobile laboratories at the completion of a boring,

or transferred to the offsite laboratory by courier at the end of each day. Sample custody was maintained by the field sampler or field supervisor until transferred to one of the laboratories. Sample custody was documented on standard chain-of-custody forms. Chain-of-custody forms are included with the laboratory reports in Appendix B.

4.3 Sample Analytical Program

Analytical work was conducted by California-certified laboratories using standard EPA test methods and appropriate state-required modifications. Soil samples were analyzed daily in two onsite mobile laboratories. One lab was equipped with two gas chromatography/mass spectrometry (GC/MS) systems with autosamplers capable of performing EPA Method 8260 for VOCs, while a second onsite mobile laboratory analyzed samples by EPA Method 418.1 and for diesel by EPA Modified Method 8015. Soil samples were also taken to a stationary laboratory daily by courier for analyses of other COCs, such as semi-volatile organic compounds (SVOCs), metals including hexavalent chromium, PCBs, and others. The stationary laboratory was contracted for additional analyses and for QA/QC backup.

Analytical methods were selected for potential COCs based on the Phase I Preliminary environmental site assessments findings (Kennedy/Jenks Consultants, 1996). Analytical methods selected and the number of samples analyzed for each boring are detailed in Table 1 and summarized below:

- All samples, except as noted, were analyzed for VOCs, including gasoline by an onsite mobile laboratory by EPA Method 8260. A limited number of samples collected by the limited access direct-push method were analyzed for VOCs and TRPH at the stationary laboratory by EPA Methods 8010/8020 and 418.1. These samples were collected near the end of the field program after the mobile laboratories had already left the Facility.

- All samples were analyzed for petroleum hydrocarbons by an onsite mobile laboratory by EPA Method 418.1 for TRPH. TRPH detections were also

analyzed in the mobile laboratory for hydrocarbon speciation by EPA Method 8015 modified for diesel and heavy hydrocarbons.

- Samples collected at locations with potential metals concerns were analyzed by an offsite laboratory by EPA Methods 6010, 7196, and 7471.

- Samples collected at locations with potential PCB concerns were analyzed by an offsite laboratory by EPA Method 8080.

- Samples collected at a location with potential cyanide concerns were analyzed by an offsite laboratory by EPA Method 9010 for total cyanides.

- Samples collected at locations with potential pesticide concerns were analyzed by an offsite laboratory by EPA Method 8080.

- Samples collected at locations with potential radioisotope concerns were analyzed by an offsite laboratory by EPA Methods 900.0 and 901.1.

- Ten percent of the mobile laboratory non-detect results by EPA Method 8260 for VOCs were also run by the stationary laboratory as a QA/QC check.

- Ten percent of the mobile laboratory non-detect results by EPA Method 418.1 for TRPH were also run by the stationary laboratory as a QA/QC check.

- Samples with Total VOCs greater than 200 μg/kg detected by EPA Method 8260 in the mobile laboratory were also analyzed for VOCs at the stationary laboratory for confirmation.

5.0 INVESTIGATION RESULTS

This section presents the results of the Phase II Soil Characterization of Parcel A. The data are discussed by areas in the same order presented in Section 4.0 and Table 1. Each discussion begins with a brief summary of the specific borings associated with each area and the analytical tests performed.

The sections are sub-divided into organic and inorganic data for each location investigated. Organics include the results of analyses for VOCs, petroleum hydrocarbons, SVOCs, PCBs, and pesticides, while the inorganic section focuses on the results of analyses for Title 22 metals and cyanide. Figures 6A-G, 7A-G, and 8A-G present data for trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), and tetrachloroethene (PCE), respectively and Figures 9A-G, 10A-G, and 11A-G present data for total chrome, arsenic and lead, respectively. Each series of figures includes seven members, A through G, that show constituent concentrations detected at the following respective depths: 1 foot, 4 feet, 10 feet, 15 feet and 20 feet, 25 feet and 30 feet, 40 feet, and 50 feet bgs. These compounds and metals were selected as representing the most important COCs in Parcel A for the ongoing risk assessment and also as the most likely COCs based on the known processes that operated in the area.

Tables 3 and 3A provide a summary of the VOC results from analyzes performed by the mobile laboratory and stationary laboratory, respectively. Tables 4 through 4D provide TRPH and TPH results from the mobile and stationary laboratories as noted. Table 5 presents the results of the SVOC analyses.

Overall, there were seven background metals detected in all soil samples analyzed (Table 6): 1) barium, 2) total chromium, 3) cobalt, 4) copper, 5) nickel, 6) vanadium, and 7) zinc.

Specific Facility-wide ranges and average values are presented in Table 2. References cited for the common range of background metals concentrations in soil include:

- Lindsay, Willard L., 1979, "Chemical Equilibria in Soils," John L. Willey & Sons, New York, New York.

- Shacklette, H.T., and Boerngen, J.G., 1984, "Element Concentrations in Soils and Other Surficial Materials in the Conterminous United States," USGS Professional Paper 1270, U.S. Government Printing Office, Washington, D.C.

5.1 Area 1

Area 1 occupies about 10 percent of Parcel A. Forty-one soil borings were drilled and approximately 185 soil samples were analyzed at eight potential areas of concern in Area 1 (Figure 2). Only 34 percent of the samples showed concentrations greater than detection limits of the methods used, with the exception of background metals that were detected in almost every sample. These detections are detailed in the following subsections. Arsenic was detected in only about 2 percent of the 413 soil samples tested for metals in Parcel A, with a maximum of 350 milligrams/kilogram (mg/kg), minimum of 12 mg/kg, and average of 101 mg/kg. Lead was detected in only about 1 percent of the 413 samples tested in Parcel A, with a maximum of 72 mg/kg, minimum of 8 mg/kg, and average of 30 mg/kg. Distribution of chemical detections by depth for 1,1-DCE, TCE, PCE, arsenic, total chromium, and lead are presented in Figures 6 through 11.

5.1.1 Building 40

Three borings were drilled in Building 40: Boring 1-1 was pushed to 25 feet bgs and borings 1-1A and 1-2 were pushed to 10 feet bgs. Soil samples were collected at the depths described in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), and Title 22 metals (6010, 7196, and 7471).

5.1.1.1 Organics

TCE was the only VOC detected with concentrations of 19 and 12 µg/kg , in the 1-foot bgs samples in borings 1-1A and 1-2, respectively, and 12 µg/kg at 25 feet bgs in boring 1-1 (Table 3).

TRPH was detected at concentrations of 19 and 26 mg/kg in the 1-foot and 4-foot samples from borings 1-1A (Tables 4B and 4C). TRPH was also detected at 22 mg/kg at 20 feet bgs in boring 1-1.

No detection of SVOC chemicals were reported at this location (Table 5).

5.1.1.2 Inorganics

Results of the metals analyses were generally typical of the soils in this area. Barium, chromium (total), cobalt, copper, nickel, vanadium, and zinc were detected in all of the samples at concentrations that appear typical of background values (Tables 2 and 6). These levels are well below both the Total Threshold Limit and Concentration (TTLC) and 10 times the Soluble Threshold Limit Concentration (STLC) (Table 2).

5.1.2 Building 41

Four borings were drilled at Building 41. Boring 1-3 was pushed to 10 feet bgs inside the building, and borings 1-4, 1-5, and 1-6 were drilled to 50 feet bgs outside on the north, east, and south, respectively. Soil samples were collected at the depths described in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), and Title 22 metals (6010, 7196, 7471).

5.1.2.1 Organics

VOCs were detected in soil samples from the four borings at Building 41 (Table 3). Soils from all four borings contained 1,1-DCE. Concentrations greater than 200 μg/kg were detected in Boring 1-6 at 30 feet bgs (300 μg/kg) and 40 feet bgs (900 μg/kg estimated). All other detections were below 200 μg/kg (Figures 6 through 8).

TCE was detected in samples from borings 1-4, 1-5, and 1-6. The highest concentrations were 89 to 200 μg/kg, in the samples from 30 through 50 feet bgs in boring 1-6. TCE levels in the remaining samples were relatively low, at 5.5 to 54 μg/kg (Table 3).

Additional VOCs were reported at generally low concentrations in samples from borings 1-4 and 1-6 (Table 3). The deeper samples in both borings contained 1,1,1-TCA at 5.9 to 15 μg/kg and the 40-foot sample in boring 1-6 had 6.1 μg/kg of trans-1,2-DCE. The samples from 10 to 40 feet in boring 1-4 contained cis-1,2-DCE at 8.1 to 56 μg/kg.

Petroleum hydrocarbons were detected above 110 mg/kg only in the 1-foot sample from boring 1-4; TRPH was reported at 4,300 mg/kg from the 1-foot sample from boring 1-5 by EPA Method 418.1 analysis (Table 4). Hydrocarbons were not detected in the deeper samples from borings 1-4, 1-5, or 1-6.

An earlier investigation conducted by Woodward-Clyde Consultants (June 1987) of diesel fuel tanks 19T and 20T located immediately north of Building 41 and associated piping into Building 41 indicate the presence of TRPH by EPA Method 418.1. Woodward-Clyde Consultants found concentrations as high as 19,000 mg/kg in their boring B-2 located inside of Building 41 adjacent to a suspected leak in the distribution line. Based on their investigation of this area, Woodward-Clyde Consultants concluded that lateral spreading was estimated up to 30 feet.

Borings 1-4, 1-5, and 1-6 of this soil characterization are all located outside of Building 41 at approximate distances from boring B-2 of 45 feet, 55 feet, and 85 feet,

respectively. The present data support the Woodward-Clyde Consultants' (June 1987) conclusion that lateral spreading of 30 feet is reasonable and explains the lack of TRPH detections in the soils analyzed for this program.

Several SVOCs were detected at low concentrations in the 4-foot samples from boring 1-5 (Table 5):

Compound	Concentration (µg/kg)
Anthracene	160
Benz(a)anthracene	380
Chrysene	440
Fluoranthene	570
Phenanthene	550
Pyrene	650

All of these are coal-tar derivatives. Samples from the Building 41 area also were reported to contain bis(2-ethylhexyl)phthalate; the 1-foot sample in boring 1-4 at 790 µg/kg, the 10-foot sample in boring 1-5 at 120 µg/kg, and the 1-foot and 30-foot samples at 310 and 200 µg/kg, respectively.

5.1.2.2 Inorganics

The metals analyses were generally typical of the soils in this area. Barium, chromium (total), cobalt, copper, nickel, vanadium, and zinc were detected at concentrations that appear typical of background values (Tables 2 and 6). Arsenic was reported at a low concentration of 14.0 mg/kg in the 4-foot sample from boring 1-5. This arsenic concentration is well below the TTLC of 500 mg/kg and much less than 10 times the 5.0 mg/L STLC (Table 2).

5.1.3 Building/Area 45

Five borings (1-7 through 1-11) were pushed to 10 feet bgs in and around Building/Area 45. Soil samples were collected as described in Table 1 and analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), Title 22 metals (6010, 7196, and 7471), and cyanide (9010).

5.1.3.1 Organics

No VOCs exceeded the detection limit of 5 µg/kg in the samples from Building/Area 45 (Table 3).

Petroleum hydrocarbons were detected in several samples; the highest concentration was 160 mg/kg TRPH and 110 mg/kg TPH-E (motor oil) in the 4-foot sample from boring 1-9 (Table 4).

Several SVOCs compounds were detected at low concentrations in the 1-foot samples from borings 1-7 and 1-9 (Table 5):

Compound	Concentration (µg/kg)	
	Boring 1-7	Boring 1-9
Benz(a)anthracene	190	260
Benzo(b)fluoranthene	ND	340
Benzo(a)pyrene	ND	270
Chrysene	220	310
Fluoranthene	270	310
Pyrene	280	360

All of these are coal-tar derivatives. In addition, phenol was reported at 140 µg/kg in the 4-foot sample from boring 1-10.

5.1.3.2 Inorganics

Metals analyses from the Building/Area 45 were generally typical of the local soils. Barium, chromium (total), cobalt, copper, nickel, vanadium, and zinc were detected in concentrations that appear typical of background values (Tables 2 and 6). Arsenic was reported at a concentration of 12.0 mg/kg in the 4-foot sample from boring 1-8. This arsenic concentration is well below the TTLC of 500 mg/kg and much less than 10 times the 5.0 mg/L STLC (Table 2).

No cyanide exceeded the method detection limit of 0.2 mg/kg in soils from the Building/Area 45 (Table 12).

5.1.4 Building 66-1 Area

Six borings were drilled around the wash down area at Building 66-1. Borings 1-12, and 1-34 through 1-37 were pushed to 10 feet bgs. Boring 1-13 met refusal at 2.5 feet bgs. Soil samples were collected as described in Table 1 and analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), Title 22 metals (6010, 7196, and 7471), and cyanide (9010).

5.1.4.1 Organics

Several VOCs were detected in the 1-foot samples from borings 1-12, 1-13, and 1-37 (Table 3):

Compound	Concentration (µg/kg)		
	1-12	1-13	1-37
1,1 DCE	ND	ND	19
cis-1,2-DCE	170	830	6.2
Ethylbenzene	5.6	1900	ND
PCE	6.4	490	37
Toluene	ND	79	ND
1,1,1-TCA	ND	ND	51
TCE	250	210,000	530
m,p-xylenes	ND	3700	ND
o-xylenes	ND	630	ND

Concentrations of TCE and cis-1,2-DCE were detected in the 1-foot sample from boring 1-35, and TCE was detected at 1 foot in 1-34. VOCs were not detected in the deeper samples from these borings.

Petroleum hydrocarbons were detected in the 1-foot sample from boring 1-13 (Table 4). Most notably, TPH-E as gasoline was reported at 1,900,000 µg/kg (Table 3). TRPH, TPH-E (diesel), and TPH-E (motor oil) also were reported at 5,900, 1,200, and 4,400 mg/kg, respectively. TRPH and TPH-E (motor oil) were reported in the 1-foot samples from borings 1-12 and 1-34, and in the 1-foot and 4-foot samples from boring 1-37 at concentrations less than 250 mg/kg. Petroleum hydrocarbons did not exceed the detection limit of 10 mg/kg in any of the 10-foot samples collected from these borings.

The 1-foot sample from boring 1-13 contained bis(2-ethylhexyl)phthalate and butyl benzyl phthalate at 390 and 120 µg/kg, respectively. The 1-foot sample from boring 1-35 contained several coal tar-based SVOC compounds as follows (Table 5):

Compound	Concentration (µg/kg)
Benz(a)anthracene	460
Benzo(a)pyrene	540
Benzo(b)fluoranthene	640
Benzo(g,h,i)perylene	470
Chrysene	550
Fluoranthene	800
Indeno(1,2,3-cd)pyrene	480
Phenanthene	190
Pyrene	600

SVOCs were not detected in the remaining samples from the Building 66-1 area.

5.1.4.2 Inorganics

Metals results from the soils at Building 66-1 were generally typical of the local soils. The only exceptions were the 1-foot samples from borings 1-13 and 1-35, which contained arsenic at 55.0 and 350 mg/kg, respectively (Tables 2 and 6). These concentrations are higher than typical in this area (Table 2). They are below the TTLC of 500 mg/kg, but are more than 10 times the STLC of 5.0 mg/L. Cadmium also was detected in only the 1-foot sample from boring 1-35 at 9.4 mg/kg; this is well below the 100 mg/kg TTLC, but is nearly 10 times the 1.0 mg/L STLC. Neither arsenic nor cadmium was detected in the 4-foot and 10-foot samples.

No cyanide exceeded the method detection limit of 0.2 mg/kg in soil samples from the Building 66-1 area (Table 12).

5.1.5 Chromium Recovery System (CRS) Area

Six borings were drilled in and around the CRS area. Borings 1-14 through 1-18 were drilled to 25 feet bgs, and boring 1-38 was drilled to 50 feet bgs. Soil samples were collected as described in Table 1 and analyzed for VOCs (8260 and/or 8010/8020),

petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and pH (9045).

5.1.5.1 Organics

VOCs were detected at low concentrations in the samples from boring 1-18 (Table 3). TCE was detected at 12 μg/kg in the 25-foot sample, and 1,1-DCE was detected in the 15-foot and 25-foot samples, at 10 and 25 μg/kg, respectively. VOCs were not detected in the remaining samples from the CRS area.

TRPH was detected at concentrations less than 90 mg/kg in samples to 20-feet bgs in borings 1-14, 1-15, 1-16, and 1-18 (Tables 4B and 4C). Among the 25-foot samples, TRPH was detected only in the sample from 1-15 at 23 mg/kg.

5.1.5.2 Inorganics

Metals results from the soils in the CRS area were generally typical of the local area. The only exception was the 1-foot sample for boring 1-38, which contained arsenic at 150 mg/kg and cadmium at 5.0 mg/kg (Tables 2 and 6). This arsenic level is below the TTLC, but greater than 10 times the STLC (Table 2). The cadmium level is below the TTLC and less than 10 times the STLC. Chromium concentrations in the samples from the CRS area ranged from 17 to 38 mg/kg, below 10 times the STLC of 5 mg/kg.

pH values are typically in the 6.5 to 8.0 range, with the 1-foot sample at 1-17 at 8.2 and the 50-foot sample at 1-38 at 8.1 (Table 13).

5.1.6 Chemical Etching Area

Borings 1-19 through 1-22 were pushed to 25 feet bgs in the chemical etching area. Soil samples were collected at the depths described in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and pH (9045).

5.1.6.1 Organics

Soil samples from the chemical etching area were reported to contain 1,1-DCE, TCE, and PCE (Table 3). The highest concentration of 1,1-DCE was 320 µg/kg in the 25-foot sample from boring 1-20. In addition, 1,1-DCE was also detected in all four borings with concentrations ranging from 5.4 to 60 µg/kg at depths down to 20 feet bgs. TCE was detected at 190 µg/kg in the 25-foot sample from boring 1-20. TCE also was reported at concentrations of 5.1 to 9.9 µg/kg in the 10- and 20-foot samples from boring 1-20 and in the 4-foot sample from 1-19. PCE was reported at 22 and 25 µg/kg, respectively, in the 1-foot and 4-foot samples from boring 1-19.

Petroleum hydrocarbons were detected at concentrations less than 65 mg/kg in the 4-foot sample from boring 1-19, the 1-foot, 10-foot, and 25-foot samples from boring 1-20, and the 4-foot sample from boring 1-21 (Table 4A). TRPH was detected at 28,000 mg/kg in the 1-foot sample from boring 1-19 and 3,200 mg/kg in the 4-foot sample from boring 1-20. Also detected was TPH (motor oil) at 2,200 mg/kg in the 1-foot sample from boring 1-19 and at 1,800 mg/kg in the 4-foot sample from boring 1-20. The higher petroleum hydrocarbon detections were all within 4 feet of the surface.

5.1.6.2 Inorganics

Metals concentrations in the soils in the chemical etching area generally were typical of the local area. Arsenic was detected only in the 1-foot samples from borings 1-19 and 1-22, at 90 and 36 mg/kg, respectively (Tables 2 and 6). Both of these are well below the TTLC of 500 mg/kg, but the 1-19 sample does exceed 10 times the 5.0 mg/L STLC (Table 2).

pH values are typically in the 7.0 to 8.0 range, with the 10-foot sample from 1-19 at 8.1 (Table 13).

5.1.7 Area Southeast of Building 41

Four borings (1-23 through 1-26) were drilled to 50 feet bgs in the area extending southwest from Building 41 to Building/Area 45. Soil samples were collected as described in Table 1 and analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and cyanide (9010).

5.1.7.1 Organics

1,1-DCA, 1,1-DCE, and TCE were detected in soils samples from the area southeast of Building 41 (Table 3). The 1,1-DCE was detected at depths of 10 to 50 feet in borings 1-23 and 1-24 at concentrations of less than 80 µg/kg. The 1,1-DCA was reported concentrations of 5.5 to 8.3 µg/kg in the samples from 10 to 30 feet in boring 1-25. TCE was detected in the 40-foot and 50-foot samples from boring 1-23, at 11 and 7.8 µg/kg, respectively.

No petroleum hydrocarbons were detected in samples from borings 1-23 and 1-24 (Table 4). TRPH was only detected at 18 mg/kg in the 50-foot sample from boring 1-25 and in the 1-foot and 50-foot samples from boring 1-26 at 19 mg/kg and 45 mg/kg, respectively (Table 4).

5.1.7.2 Inorganics

Results of the metals analyses were generally typical of the soils in the local area. Barium, chromium (total), cobalt, copper, nickel, vanadium, and zinc were detected in concentrations that appear typical of background values (Tables 2 and 6). No additional or anomalous metals were detected in these analyses.

Cyanide was not detected in the samples from the area southeast of Building 41 (Table 12).

5.1.8 Open Space in Area 1

Nine borings were pushed to 10 feet bgs in the open space portions of Area 1. Borings 1-27, 1-27A, and 1-27B were located generally east of Building 41 and north of Building/Area 45. Borings 1-28 and 1-29 are northeast and east of Building/Area 45. Borings 1-30, 1-31, and 1-32 are located in the open area between Building 40 and the CRS area on the west and Building 66-1 and Building/Area 45 on the east. Boring 1-33 is located south of Building 66-1. Soil samples from these borings were collected as described in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), and Title 22 metals (6010, 7196, and 7471).

5.1.8.1 Organics

VOCs were not detected in most of the soil samples from the open space in Area 1. TCE was detected in the samples from boring 1-33 at 22 to 40 μg/kg, and m,p-xylenes were reported at 5.1 μg/kg (just above the 5.0 μg/kg detection limit) in the 4-foot sample from boring 1-27A (Table 3). VOCs were not detected in the remaining samples.

Petroleum hydrocarbons were detected in about half of the samples from the open space area (Table 4). In most of these samples, the TRPH (EPA 418.1) analyses gave results of less than 100 mg/kg and were detected at either 1 foot or 4 feet bgs. Two of the samples also showed TPH-E (motor oil) at 31 and 52 mg/kg. Higher hydrocarbon levels were reported from only two samples. The 4-foot sample from boring 1-29 showed TRPH of 1,100 mg/kg and TPH-E (motor oil) of 4,800 mg/kg. TRPH of 140 mg/kg and TPH-E (motor oil) of 230 mg/kg were reported from the 1-foot sample in boring 1-27.

Several coal tar-derived SVOCs were detected in samples from borings 1-27, 1-27A, and 1-27B (Table 5).

Compound	Concentration (µg/kg)			
Boring	1-27	1-27A	1-27A	1-27B
Depth	1 foot	1 foot	4 feet	1 foot
Anthracene	370	ND	ND	ND
Benz(a)anthracene	4800	280	320	730
Benzo(b)fluoranthene	9000	430	470	1100
Benzo(k)fluoranthene	2900	ND	ND	450
Benzo(g,h,i)perylene	6300	250	460	1200
Benzo(a)pyrene	1300	340	400	1000
Chrysene	7300	360	450	1000
Dibenz(a,h)anthracene	1600	ND	ND	ND
Fluoranthene	6400	420	430	1100
Indeno(1,2,3-cd)pyrene	5300	270	460	1100
Phenanthene	1300	170	120	360
Pyrene	5300	180	170	550

In addition, bis(2-ethylhexyl)phthalate was reported in the 1-foot sample from boring 1-27A and in the 4-foot sample from boring 1-31 at concentrations of 150 and 120 µg/kg, respectively. No other SVOCs were detected throughout the open space in area 1.

5.1.8.2 Inorganics

Metals detected in samples from the open space portions of Area 1 were generally typical of soils in the local area. However, lead was detected in two samples; at 1 foot in boring 1-27 and at 4 feet in boring 1-27A (Tables 2 and 6). Concentrations were 72 and 8.0 mg/kg, respectively. Both samples were well below the TTLC of 1,000 mg/kg, but the sample from boring 1-27 at 1-foot bgs exceeds 10 times the 5.0 mg/L STLC (Table 2).

5.2 Area 1A

Area 1 is approximately 20 acres. Twenty soil borings were drilled and approximately 126 soil samples were analyzed at two areas of potential concern in Area 1A. Only 22 percent of the samples showed concentrations greater than detection limits of the methods used other than background metals. These detections are expanded on in the following subsections.

5.2.1 Border With International Light Metals

Eight borings (1A-1 through 1A-7 and 1A-5A) were drilled to 50 feet bgs along the rail lines on the northwest border of the Facility adjoining the ILM property. Soil samples were collected from these borings at the depths discussed in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and PCBs (8080).

5.2.1.1 Organics

TCE was the only VOC detected in the soil samples from the area along the border with ILM (Table 3). The TCE was detected at various depths in 21 of the 53 soil samples. Concentrations were generally low, ranging from 5.0 to 60 μg/kg. The highest concentration was 170 μg/kg, detected in the 50-foot sample from boring 1A-6.

Petroleum hydrocarbons were detected in only one sample from this area (Table 4). TRPH was reported at a concentration of 17 mg/kg detected in the 4-foot sample from boring 1A-3. No other hydrocarbons were reported.

No PCBs were detected in soil samples analyzed along the border with ILM (Table 7).

5.2.1.2 Inorganics

Results of the metals analyses from the borings along the border with ILM were generally typical of the soils in the local area. Barium, chromium (total), cobalt, copper,

nickel, vanadium, and zinc were detected in all the samples at concentrations that appear typical of background values (Table 6). Lead was detected at a concentration of 12 mg/kg in the 1-foot sample from boring 1A-2. The TTLC and STLC for lead are 1,000 mg/kg and 5.0 mg/L, respectively (Table 2). No additional or anomalous metals were detected in these analyses.

5.2.2 Open Space in Area 1A

Twelve borings, designated 1A-8 through 1A-19, were drilled in the open space portion of Area 1A. Boring 1A-17 was drilled to 50 feet and the remainder were drilled to 25 feet bgs. Soil samples were collected from these borings at the depths discussed in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), PCBs (8080), and pesticides (8080) (only in 1A-9).

5.2.2.1 Organics

VOCs generally were not detected in the samples from the open space in Area 1A. Only TCE and 1,1-DCE were reported in a few samples at low concentrations (Table 3). The 1,1-DCE was reported in the 1-foot sample from boring 1A-14, and in the 20-foot sample from boring 1A-15 at concentrations of 6.9 and 8.3 µg/kg, respectively. TCE was reported at concentrations of 6.9 to 11 µg/kg in samples from 4 feet to 20 feet bgs in boring 1A-8, and at 5.6 and 14 µg/kg in the 15-foot and 20-foot samples from boring 1A-19. No other VOC detections were reported.

Petroleum hydrocarbons were not detected in most of the samples from the open space in Area 1A. Concentrations of TRPH not exceeding 300 mg/kg were detected in four samples from borings 1A-13, 1A-15, 1A-16, and 1A-19 (Tables 4 and 4C). The sample from boring 1A-16 also showed 200 mg/kg TPH-E (motor oil). Higher hydrocarbon concentrations were detected in samples from borings 1A-10, 1A-11, 1A-17, and 1A-18 (Tables 4, 4A, and 4C):

Boring	Depth	Concentration (mg/kg)	
		TRPH	TPH-E (Motor Oil)
1A-10	4	530	220
	10	160	1800
1A-11	1	1300	1200
	4	64	ND
	10	230	1000
	15	300	ND
1A-17	1	7900	8200
1A-18	1	400	ND
	4	27	ND
	25	32	ND

No PCBs were detected in the soil samples analyzed in the open space in Area 1A (Table 7).

Pesticides were not detected in boring 1A-9 (Table 8).

5.2.2.2 Inorganics

Results of the metals analyses from the borings in the open space of Area 1A were generally typical of the soils in the local area. Barium, chromium (total), cobalt, copper, nickel, vanadium, and zinc were detected in all samples at concentrations that appear typical of background values (Tables 2 and 6). No additional or anomalous metals were detected in these analyses.

5.3 Supplemental Area Northwest

The Supplemental Area Northwest is approximately 11 acres. Thirteen soil borings were drilled and approximately 34 soil samples were analyzed in Supplemental Area Northwest. Only 9 percent of the samples showed concentrations greater than

detection limits of the methods used other than background metals. These detections are expanded on in the following subsections.

Thirteen borings (SA-NW-1 through SA-NW-12) were located in the Supplemental Area Northwest. Boring SA-NW-7 was drilled to 50 feet bgs and the remaining borings were pushed to 10 feet bgs. Soils samples were collected from these borings at the depth intervals described in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), Title 22 metals (6010, 7196, and 7471), and pH (9045). Samples from borings SA-NW-1 through SA-NW-3 also were analyzed for SVOCs (8270), PCBs (8080), and pH (9045). Samples from boring SA-NW-13 were tested for radioisotopes.

5.3.1 Organics

VOCs were not detected in nearly all the samples from the Supplemental Area Northwest (Table 3). Three samples at widely separated locations were reported to have low levels of three different compounds: 1) 1,1-DCE at 31 μg/kg in the 4-foot sample from boring SA-NW-3, 2) trichlorofluoromethane (Freon-11) at 24 μg/kg in the 4-foot sample from boring SA-NW-5, and 3) TCE at 10 μg/kg in the 4-foot sample from SA-NW-9. No VOCs were detected in the remaining samples from this area.

Petroleum hydrocarbons were detected at low concentrations in a few samples (Tables 4 and 4A). TRPH was reported at 11 to 46 mg/kg in eight samples from various locations and depths in this area. In addition, TRPH was reported at 250 mg/kg in the 10-foot sample from boring SA-NW-3, but was not detected at 1 foot or 4 feet at that location. Petroleum hydrocarbons were not detected in the remaining samples.

No compounds were detected in the SVOC analyses from borings SA-NW-1 through SA-NW-3 (Table 5).

No PCBs were detected in soil samples analyzed from borings SA-NW-1 through SA-NW-3 (Table 7).

5.3.2 Inorganics

Metals analyses of soil samples from the Supplemental Area Northwest were generally typical of results from the local area. Barium, chromium (total), cobalt, copper, nickel, vanadium, and zinc were detected in all of the samples at concentrations that appear generally typical of background values (Tables 2 and 6). No additional or anomalous metals were detected in these analyses.

Samples from boring SA-NW-13 contain normal background levels of natural radioactivity (Table 14). Radioisotope laboratory analytical reports are presented in Appendix B.

Samples from Supplemental Area Northwest had pH values ranging from 6.8 in boring SA-NW-9 at 4 feet bgs to 8.1 in boring 5-4 at 4 feet and 6 feet bgs.

5.4 Supplemental Area Central

There were three areas of potential concern in Supplemental Area Central: 1) Building 37, 2) Concrete Pad 15, and 3) Building 36.

Building 37 was previously investigated in 1996 and the results presented in a report titled Parcel A, Phase II Subsurface Investigation (Kennedy/Jenks Consultants, 1996). Analysis of the results identified potential areas of concern within Building 37. Building 37 has since been demolished and the footprint of the building has been intensively investigated and soils have been remediated, excavated, and recompacted (Montgomery-Watson, Inc., 1997a and 1997b).

Concrete Pad 15 was also previously investigated in the same program. VOCs were detected in the area down to 25 feet bgs. A supplemental investigation to 40 feet bgs show no VOCs below 35 feet bgs, with the highest detection being TCE at 140 µg/kg at 25 feet bgs, and only 8 µg/kg at 35 feet bgs. No VOCs were detected at 40 feet bgs.

Neither the Building 37 footprint nor the area of Concrete Pad 15 were further investigated for the Phase II Soil Characterization.

Supplemental Area Central is approximately 7 acres. Seventeen soil borings were drilled and approximately 96 soil samples were collected at the Building 36 area of Supplemental Area Central. A total of 89 percent of the samples detected COCs and are expanded on in the following subsections. The high percentage of detections is due to the concentration of soil samples in the Building 36 area, an area of known VOC impact (Figures 6A though 6G and 7A through 7G).

5.4.1 Building 36 Area

Seventeen borings were located in the Building 36 area. Fourteen of these were pushed to 25 feet bgs. Boring 36-5 had refusal at 10 feet due to concrete rubble in the subsurface, 36-6 was pushed to 35 feet bgs, and 36-13 and 36-14 were drilled to 50 feet bgs. Soils samples were collected as described in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020) and petroleum hydrocarbons (418.1 and 8015M).

5.4.1.1 Organics

1,1-DCE and TCE are the primary constituents detected in the Building 36 area and were present in 70 out of 90 samples analyzed. The highest concentration of both constituents (1,1-DCE at 5,400 µg/kg and TCE at 97,000 µg/kg) was at 20 feet bgs in boring 36-13. However, both chemicals were detected to 50 feet bgs. In addition, concentrations of other constituents were also highest in boring 36-13 at 20 feet bgs: 1,1-DCA (6,300 µg/kg), cis-1,2-DCE (1,600 µg/kg), and 1,1,1-TCA (33,000 µg/kg).

Overall, the distribution of COCs, primarily 1,1-DCE and TCE in the Building 36 area, is as follows:

- 1,1-DCE and TCE were detected at 8 of 11 sampling locations analyzed at 1 foot bgs (Figures 6A and 7A). The highest concentration of 1,1-DCE was 73 µg/kg in boring 36-8 and TCE was 110 µg/kg in boring 36-10 inside Building 1.

- 1,1-DCE and TCE were detected at 12 of 15 sampling locations analyzed at 4 feet bgs (Figures 6B and 7B). The highest concentration of 1,1-DCE was 130 µg/kg in boring 36-8, and TCE was 260 µg/kg in boring 36-8.

- 1,1-DCE and TCE were detected at 12 of 16 sampling locations analyzed at 10 feet bgs (Figures 6C and 7C). The highest concentration of 1,1-DCE was 100 µg/kg in boring 36-11, and TCE was 170 µg/kg in boring 36-10.

- 1,1-DCE and TCE were detected at 15 of 15 sampling locations analyzed at 15 feet to 20 feet bgs (Figures 6D and 7D). The highest concentration of 1,1-DCE was 5,400 µg/kg in boring 36-13, and TCE was 97,000 µg/kg in boring 36-13. These are the highest detections in the Building 36 area. In addition, high concentrations of 1,1-DCA (6,300 µg/kg), cis-1,2-DCE (1,600 µg/kg), 1,1,1-TCA (33,000 µg/kg), benzene (1,200 µg/kg), ethylbenzene (370,000 µg/kg), toluene (3,700,000 µg/kg), m,p-xylenes (2,300,000 µg/kg), and o-xylenes (690,000 µg/kg).

- 1,1-DCE and TCE were detected at 13 of 15 sampling locations analyzed at 25 feet to 30 feet bgs (Figures 6E and 7E). The highest concentration of 1,1-DCE was 760 µg/kg in boring 36-7, and TCE was 990 µg/kg in boring 36-7.

Two 50-foot-deep boreholes were drilled in the Building 36 area, 36-13 and 36-14 (Figures 6F, 6G, 7F, and 7G). 1,1-DCE was detected at a concentration of 110 µg/kg in boring 36-14 at 40 feet bgs, and 140 µg/kg in boring 36-13 at 50 feet bgs. TCE was detected at concentrations of 1,600 µg/kg in boring 36-13, 390 µg/kg in boring 36-14 at 40 feet bgs, and 550 µg/kg in boring 36-13 at 50 feet bgs.

Soil units Q1, Q2, and Q3 underlay the Building 36 area. The highest VOCs are around 20 feet bgs within the clayey silt and sandy silt interbeds of unit Q2. Overall, these soils are slightly coarser than the overlying Q1 soils and may tie to the increase in VOC concentration and the limited lateral spread of the VOCs with concentrations greater than 500 µg/kg at this depth.

Impact from these COCs in the Building 36 area, at concentrations less than 500 µg/kg, appears to have spread eastward and southeastward into small portions of Area 1 and Supplemental Area Northeast.

Petroleum hydrocarbons were detected at low concentrations (<70 mg/kg) in samples throughout the Building 36 area (Tables 4, 4A, 4B, and 4C). The 4-foot samples from borings 36-2 and 36-6 had the highest TRPH values of 120 mg/kg and 320 mg/kg, respectively.

5.4.1.2 Inorganics

Inorganics were not analyzed for in the Building 36 Area.

5.4.2 Open Space

The open space in Supplemental Area Central was investigated in separate studies as reported in Section 4.2.5.2.

5.5 Supplemental Area Northeast

Supplemental Area Northeast is about 6 acres. Seventeen soil borings were drilled and approximately 102 soil samples were analyzed at two areas of concern in Supplemental Area Northeast. Only 25 percent of the samples showed concentrations greater than detection limits of the methods used other than background metals. These detections are expanded on in the following subsections.

5.5.1 Diesel Fuel Line

Four borings were located along the estimated alignment of a shallow buried pipeline that reportedly transferred diesel fuel from two large above-ground tanks at the northeast corner of the Facility to the boilers in Building 41. Borings SA-NE-1, SA-NE-3, and SA-NE-4 were pushed to 25 feet bgs; boring SA-NE-2 was drilled to 50 feet bgs. Soils samples were collected from these borings at the depth intervals described in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), and SVOCs (8270).

5.5.1.1 Organics

1,1-DCE and TCE were detected in samples from borings SA-NE-1, SA-NE-2, and SA-NE-3 (Table 3). The highest TCE concentrations were 69 to 120 μg/kg at 30 to 40 feet in SA-NE-2. TCE also was detected at 6.2 to 44 μg/kg at 4 feet and 10 feet bgs in SA-NE-1, at 4 feet, and 10 to 50 feet bgs in SA-NE-2, and 10 to 20 feet in SA-NE-3. 1,1-DCE was detected at 10 feet in SA-NE-1 and SA-NE-3, and from 4 to 40 feet in SA-NE-2. The highest concentration was 69 μg/kg in the 40 foot sample from SA-NE-2. VOCs were not detected in the remaining samples.

TRPH was detected in the 4-foot samples from borings SA-NE-3 and SA-NE-4 at 4,440 and 680 mg/kg, respectively (Table 4). Low TRPH levels of 11 to 35 mg/kg were detected at 4 feet in SA-NE-1 and at 1 foot in SA-NE-2, SA-NE-3, and SA-NE-4. The 1-foot sample in SA-NE-3 also contained TPH-E (motor oil) at 94 mg/kg. Petroleum hydrocarbons were not detected in the remaining samples.

SVOCs were detected in only two of the samples from this area (Table 5). The 50-foot sample from boring SA-NE-2 showed bis(2-ethylhexyl)phthalate at 130 μg/kg and pyrene at 100 μg/kg; the detection limits for these compounds were 100 μg/kg. The 1-foot sample from boring SA-NE-4 contained several coal tar-derived compounds:

Compound	Concentration (µg/kg)
Benz(a)anthracene	1000
Benzo(b)fluoranthene	1300
Benzo(k)fluoranthene	570
Benzo(g,h,i)perylene	1000
Benzo(a)pyrene	1200
Chrysene	1200
Fluoranthene	1800
Indeno(1,2,3-cd)pyrene	1100
Phenanthene	510
Pyrene	1200

5.5.2 Open Space in Supplemental Area Northeast

Thirteen borings (SA-NE-5 through SA-NE-17) were drilled in the open space portion of the Supplemental Area Northeast. Boring SA-NE-8 was drilled to 50 feet bgs by hollow-stem auger, boring SA-NE-16 was pushed to 10 feet, and the remainder were pushed to 25 feet bgs. Soil samples were collected following the procedures described in Table 1 and were analyzed for VOCs (8260 and/or 8010/8020), petroleum hydrocarbons (418.1 and 8015M), SVOCs (8270), and Title 22 metals (6010, 7196, and 7471).

5.5.2.1 Organics

VOCs were not detected in most of the samples from this area; low concentrations of 1,1-DCE and TCE were reported in only a few samples (Table 3). The 1,1-DCE was reported at 5.9 to 31 µg/kg at 20 feet in boring SA-NE-6, 15 to 25 feet in SA-NE-7, and at 20 feet in SA-NE-13. TCE was reported at 5.6 to 28 µg/kg at 4 feet and 20 feet in boring SA-NE-6, 1 foot and 25 feet in SA-NE-13, 4 feet, 10 feet, and 25 feet in SA-NE-15, and 15 and 20 feet in SA-NE-17. TCE also was reported at 110 µg/kg in the 20-foot sample from boring SA-NE-13. TCE was reported at 56 µg/kg from the 6-foot sample

from boring SA-NE-14. VOCs were not detected in the remaining samples and was not detected at other depth.

TRPH was detected in 10 of the 13 soil borings in Supplemental Area Northeast (Table 4). TRPH was reported at concentrations less than 200 mg/kg in the 1-foot and/or 4-foot samples from nine of the borings. In three of these samples, TPH-E (motor oil) also was reported at less than 50 mg/kg. TRPH was reported at concentrations of 15 and 31 mg/kg in samples from 30 feet and 50 feet bgs in boring SA-NE-8, but was not detected in the near-surface samples.

Higher hydrocarbon levels were detected only at borings SA-NE-14 and SA-NE-17. TRPH was reported to be 1,200 mg/kg at 6 feet in SA-NE-14, along with low levels of TPH-E (diesel) and TPH-E (motor oil). This sample also contained 13,000 mg/kg TPH as gasoline. The 10-foot sample from SA-NE-14 contained TRPH and TPH-E (diesel) at 110 and 700 mg/kg, respectively, but hydrocarbons were not detected in the samples from 15 to 25 feet. The 1-foot sample from boring SA-NE-17 contained TPH-E (diesel) at 31,000 mg/kg, and TRPH at 1,500 mg/kg. TRPH decreased to 84 mg/kg at 4 feet and TPH-E (diesel) was not detected. Hydrocarbons were not detected in the deeper samples.

Sample locations SA-NE-14 and SA-NE-17 appear to be in the area of a recently discovered pipeline that may have transferred fuel from the ASTs in the northeast corner of the Facility to the boilers in Building 41. This may account for the high concentrations of petroleum hydrocarbons at these two locations.

Several coal tar-derived SVOCs were detected in the 1-foot samples from borings SA-NE-9, SA-NE-10, SA-NE-13, and SA-NE-14, as summarized below (Table 5):

Compound	Concentration (µg/kg) (at 1 foot)			
Boring	SA-NE-9	SA-NE-10	SA-NE-13	SA-NE-14
Anthracene	110	160	ND	ND
Benz(a)anthracene	260	530	300	900
Benzo(b)fluoranthene	ND	620	300	1500
Benzo(k)fluoranthene	ND	ND	330	ND
Benzo(g,h,i)perylene	ND	ND	ND	480
Benzo(a)pyrene	ND	510	ND	600
Chrysene	270	560	400	910
Dibenz(a,h)anthracene	ND	ND	ND	120
Fluoranthene	540	680	320	180
Hexachlorobutadiene	ND	ND	180	ND
Indeno(1,2,3-cd)pyrene	ND	330	ND	480
Phenanthene	450	670	160	ND
Pyrene	860	940	540	390

In addition, bis(2-ethylhexyl)phthalate was reported at 430 µg/kg in the 1-foot sample from boring SA-NE-13 and at 150 µg/kg in the 25-foot sample from boring SA-NE-15. The only VOCs in a 4-foot sample were benz(a)anthracene and chrysene, both at 130 µg/kg in boring SA-NE-14. No other SVOCs were detected in samples from deeper than 1 foot.

5.5.2.2 Inorganics

Several samples from the open space portion of the Supplemental Area Northeast contained metals at concentrations above the average but within the range typical of the local area (Tables 2 and 6).

None of the metals detections exceed the TTLC or 10 times the STLC for any particular metal, and all fall within the anticipated common range in soils (Table 2).

5.6 Quality Assurance Results

This section includes the results of the field quality assurance (QA) sample analysis, travel blanks and equipment rinsate blanks, the 10 percent of non-detect mobile laboratory VOC and TRPH QA results, and the QA check results on mobile laboratory total VOC concentrations greater than 200 µg/kg. In addition, the RWQCB performed audits of the mobile and stationary laboratories and the RWQCB took soil sample splits. Their results matched extremely well with the mobile laboratory data.

5.6.1 Field QA

Daily travel blanks were analyzed for VOCs (8260) to monitor the possibility of outside contamination of soil samples during transport to the stationary laboratory. Travel blank analytical testing resulted in no detections, indicating the samples were not impacted during transport (Appendix B).

Daily equipment rinsate blanks were analyzed to monitor the potential cross-contamination of soil samples by the sampling equipment. All laboratory analytical results were non-detect, indicating proper cleaning of field equipment between samples (Appendix B).

5.6.2 10 Percent Non-Detect Confirmations

5.6.2.1 10 Percent VOC Non-Detects

As an additional QA check on the results of the mobile laboratory, 10 percent of non-detect EPA Method 8260 results were analyzed at the stationary laboratory. Comparison of the data are presented in Table 9. The stationary laboratory confirmed the mobile laboratory results by not detecting any VOCs in the samples tested.

5.6.2.2 10 Percent TRPH Non-Detects

As an additional QA check on the results of the mobile laboratory, 10 percent of non-detect EPA Method 418.1 results were analyzed at the stationary laboratory. Comparison of the data are presented in Table 10.

The stationary laboratory results showed detections of TRPH by EPA Method 418.1 in 11 out of 30 samples (~33 percent). However, the mobile laboratory used a screening detection limit of 20 mg/kg during the beginning of the program and then, on request by Kennedy/Jenks Consultants, changed to a detection limit of 10 mg/kg. The stationary laboratory used a detection limit of 8 mg/kg. Three of the 11 sample detections (1A-4-10, 36-5-4, and SA-NE-4-15) from the stationary laboratory are below the comparable detection limit of the mobile laboratory, and one sample (1A-7-4) is right on the 10 mg/kg detection limit. This leaves seven out of 30 samples (23 percent) that had TRPH detections by the stationary laboratory, where the mobile laboratory had non-detect. Of the detections, all but two samples had detections less than 57 mg/kg TRPH. Of the remaining two samples, one (1-5-4) showed 3,100 mg/kg and one (SA-NE-12-1) showed 170 mg/kg. This variability is not unreasonable when comparing the results of analyses of separate soil sample sleeves from the same sampling location. Due to the inhomogeneous nature of the sediments, chemical concentrations could vary widely, even within the same 6-inch sample sleeve.

Because of the difficulty inherent in analyzing duplicate soil samples, the QA data are interpreted to show acceptable correlation between the analyses and essentially confirm the mobile laboratory results.

5.6.3 QA Analysis of Total VOC>200 μg/kg

Twenty eight soil samples from areas in Parcel A were duplicate tested by the stationary laboratory when mobile laboratory results for total VOCs were greater than 200μg/kg. The purpose of the analyses was to confirm the mobile laboratory screening results (Table 11).

The soil samples are collected in two or three separate sleeves that were passed on to the laboratories for analysis. Because each laboratory received a separate sleeve, the sample tested by the mobile laboratory could be as much as 12 inches removed from the sample tested by the stationary laboratory. Due to the inhomogeneous nature of the sediments, chemical concentrations could vary widely, even within the same 6-inch sample sleeve.

The procedure for determining which samples would be used in this QA analysis was that all mobile laboratory EPA Method 8260 results >200 μg/kg for total VOCs would be confirmed. The procedure required waiting approximately 24 to 48 hours from the time the sample was collected to receipt of the mobile laboratory results. At that point, a request was made to the stationary laboratory to perform analyses of the appropriate sample. In most cases, the stationary laboratory had already received the appropriate sample to perform different analyses and would use that sample for their confirmation analysis. Since the request for QA analysis could not be made until after the mobile laboratory data were reported, many of the samples had already been partially used by the stationary laboratory, stored, and then reopened for the QA analysis request. When combining this with the difficulties of analyzing duplicate soil samples, these situations could have an impact on the samples and possibly explain why in all cases where 1,1-DCE or TCE were detected by both laboratories, the stationary laboratory results were lower.

In 14 of the 28 samples the stationary laboratory did not detect VOCs where the mobile laboratory had total VOCs greater than 200 μg/kg. In eight of the 14 samples, the stationary laboratory detection limit was very high due to matrix interference and turned out to be above the total VOC concentration detected by the mobile laboratory and could not confirm the results.

The other 14 out of 28 samples had VOC detections by both laboratories. In general, the total VOCs were within ±100 percent of each other. This variation is not unreasonable considering the differences in separate soil samples and the

heterogeneity of the soils. In addition, many of the reported concentrations from the mobile laboratory have qualifiers that indicated the concentration was estimated or was calculated out of the calibration range.

6.0 CONCLUSIONS

The Phase II Soil Characterization of Parcel A was completed according to the Field Sampling Plan (FSP) that was developed from the Phase I environmental site assessments of the Facility and reviewed and approved by the RWQCB and DTSC. The data generated during this program will provide support to develop the risk assessment, function as part of future groundwater investigations, and as input to future remediation and feasibility studies. For convenience in this work, Parcel A was subdivided into five areas:

- Area 1
- Area 1A
- Supplemental Area Northwest
- Supplemental Area Central
- Supplemental Area Northeast.

These areas were further divided into areas of potential concern, each of which was investigated individually. At the end of the Phase II Soil Characterization, four of the areas of potential concern investigated were found to contain COCs at levels such that they were designated areas of concern.

This section of the report begins with a brief description of the field program (Section 6.1), followed by a summary of subsurface soil conditions at the Facility (Section 6.2). The four areas of concern are described in Section 6.3 starting with Building 36 because it is the most extensive of the areas of concern. Findings regarding each of the five areas within Parcel A are summarized in Section 6.4.

6.1 Field Program

The field program included drilling and geologic logging of 108 soil borings and collecting 550 soil samples in Parcel A. The soil samples were analyzed for the COCs that could be present in each area of potential concern. The samples were analyzed for VOCs and petroleum hydrocarbons by an onsite state-certified laboratory. Selected

samples also were analyzed at an offsite state-certified stationary laboratory for one or more additional parameters, including, but not limited to, SVOCs, PCBs, metals, cyanide, and pH.

The QA program included blank samples and confirmation analyses of selected soil samples. Analyses of the blank samples showed no indication that soil samples were inadvertently contaminated. Confirmation analyses at a stationary laboratory supported the mobile laboratory analyses. In addition, both the mobile and stationary laboratories were audited by the RWQCB for compliance with analysis procedure methods.

6.2 Subsurface Soils

Extensive information regarding the soils within 50 feet bgs at the Facility was developed from the drilling and geologic logging in the Phase II Soil Characterization. Four distinct subsurface units were identified. Three of these were correlated over the entire Facility, while the fourth pinches out on the northwest and dips below the depth drilled on the eastern portion of the property and is not present beneath Parcel A. The uppermost soils at the Facility consist predominantly of clay and silt. These fine-grained soils are present to about 22 feet bgs on the west and thicken to about 45 feet bgs on the east. Soils below these depths are predominantly sand and silty sand to the 50-foot maximum depth drilled.

6.3 Areas of Concern

Analysis of the results of the Phase II Soil Characterization indicated four areas of concern within Parcel A:

- Building 36
- Building 66-1 washdown
- Borings 1-27 and 1-27A (located north of Building/Area 45)
- Borings SA-NE-14 and SA-NE-17 (located north of Building/Area 45 and east of Building 41).

Each of these are described in the followings paragraphs:

Building 36 (Supplemental Area Central)

Building 36 formerly was a paint and solvent storage area, and previous investigations reported VOCs in the underlying soils. As expected, the Phase II Soil Characterization detected TCE, 1,1-DCE, 2-butanone, and other VOCs in samples from borings at Building 36, and are probably related to a past, onsite release of VOCs.

The highest concentrations of chlorinated hydrocarbons were detected at 20 feet bgs in boring 36-13: 6,300 µg/kg 1,1-DCA; 5,400 µg/kg 1,1-DCE; 1,600 µg/kg cis-1,2-DCE; 33,000 µg/kg 1,1,1-TCA; and 97,000 µg/kg TCE. Concentrations of these compounds were lower in the samples above and below 20 feet, but VOCs were detected to the 50-foot maximum depth of the boring. VOC detections at 50 feet bgs in borings 36-13 were 1,1-DCA (140 µg/kg), 1,1-DCE (140 µg/kg), and TCE (550 µg/kg).

The 20-foot sample from boring 36-13 also contained the highest concentrations of aromatic hydrocarbons: 1,200 µg/kg benzene; 370,000 µg/kg ethylbenzene; 3,700,000 µg/kg toluene; 2,300,000 µg/kg m,p-xylenes; and 690,000 µg/kg o-xylenes. These aromatic hydrocarbons decreased greatly in the deeper samples; only toluene (5,900 µg/kg) and m,p-xylenes (180 µg/kg) were detected in the 50-foot sample.

The subsurface distribution of these COCs somewhat reflects a relationship with the underlying soil units. The concentrations are highest and the lateral distribution widest around 20 to 40 feet bgs, possibly indicating a lateral spread of COCs as the soil changes from primarily clay to primarily silts and even to sand at the deeper depths.

Although the COCs have high concentrations in the Building 36 area, the lateral extent of concentrations greater than 500 µg/kg is generally limited to the area along the western side of Building 36 and north to the southern end of Building 37.

Building 66-1, Washdown (Area 1)

TCE, ethylbenzene, xylenes, and other VOCs were detected in the 1-foot samples from borings at this location. These affected soils are limited in depth, as these compounds were not detected in samples deeper than 1 foot bgs. The highest concentrations were at boring 1-13, where TCE was reported at 210,000 µg/kg. These impacted soils are probably related to washdown procedures used at the Facility.

Borings 1-27 and 1-27A (Area 1)

Borings 1-27 and 1-27A are in the northeastern part of the open space in Area 1. Lead was detected in two samples from these borings: at 1 foot in boring 1-27 (72 mg/kg) and at 4 feet in boring 1-27A (8 mg/kg). Both samples were well below the TTLC of 1,000 mg/kg, but the sample from boring 1-27 exceeds 10 times the 5.0 mg/L STLC. Lead was not detected in the deeper samples, indicating maximum vertical extent of these elevated values.

Borings SA-NE-14 and SA-NE-17 (Supplemental Area Northeast):

Borings SA-NE-14 and SA-NE-17 are in the southern part of the Open Space in Supplemental Area Northeast. Petroleum hydrocarbons were detected in the shallow soils at these borings. The sample from 6 feet bgs in boring SA-NE-14 contained 13,000 µg/kg TPH as gasoline, and 1,200 mg/kg TRPH, 68 mg/kg TPH as diesel, and 33 mg/kg TPH as motor oil, along with 56 µg/kg TCE. TRPH concentrations were 110 mg/kg and TPH as diesel was 700 mg/kg in the 10-foot sample, but were not detected below 10 feet. There is a possibility that petroleum hydrocarbons detected at these two sampling locations may be related to a recently discovered pipeline that may lead from the ASTs in the northeast corner of the Facility to the boilers in Building 41.

6.4 Summary of Results by Area

6.4.1 Area 1

Eight potential areas of concern were designated and investigated within Area 1:

- Building 40
- Building 41
- Building/Area 45
- Building 66-1 Area
- CRS Area
- Chemical Etching Area
- Area Southeast of Building 41
- Open Space.

The Building 66-1 washdown area and borings 1-27 and 1-27A in the northern part of the open space were identified as areas of concern. The results of the investigation in these areas are discussed in Section 6.3.

The northwestern part of Area 1, including Building 41 and the Chemical Etching Area, shows effects from the releases at Building 36, which is discussed in Section 6.3. TCE, 1,1-DCE, and other VOCs were detected in samples from this part of Area 1. The highest concentrations were in the 40-foot sample from boring 1-6: TCE at 200 μg/kg and 1,1-DCE at 900 μg/kg.

The remaining areas were not found to contain COCs in concentrations, distribution, or frequency of occurrence to be designated as areas of concern.

6.4.2 Area 1A

Two Areas of Potential Concern were designated within Area 1A: 1) Border with ILM, and 2) Open Space.

Neither of the areas of potential concern were concluded to be areas of concern. However, TCE was detected at various depths in 21 of the 53 samples collected along the border with ILM. Concentrations ranged from 5.0 to 60 μg/kg. The only higher concentration was 170 μg/kg in the 50-foot sample from boring 1A-6. There is no indication of an onsite source of TCE in this area. Published documents from investigations conducted at ILM strongly suggest the TCE detections are related to soil conditions immediately west at ILM.

6.4.3 Supplemental Area Northwest

Four areas of potential concern were designated within Supplemental Area Northwest 1) Building 67, 2) Building 57, 3) Building 61, and 4) Building 34.

None of the areas of potential concern were concluded to be areas of concern. VOCs were not detected in most of the samples from this area and metals were within typical background ranges. Based on these results, no areas of concern were identified.

6.4.4 Supplemental Area Central

Building 36 was the only part of the Supplemental Area Central investigated in the Phase II Soil Characterization of Parcel A. Building 36 was identified as an area of concern and is described further in Section 6.3. Supplemental Area Central also includes the footprint of Building 37, which has been remediated, and a small area around a concrete pad was investigated and shown to have VOCs with limited vertical and horizontal extent. Soil excavations have been backfilled and compacted with concentrations of COCs in soil below threshold values established for the remediation program.

6.4.5 Supplemental Area Northeast

Two areas of potential concern were designated within the Supplemental Area Northeast: 1) diesel fuel line, and 2) open space.

One area of concern was identified during this investigation. The area of borings SA-NE-14 and SA-NE-17 is discussed further in Section 6.3. These borings appear to be located near a recently discovered pipeline that may lead from the ASTs in the northeast corner of the Facility to the boilers in Building 41. In addition, the southwestern part of Supplemental Area Northeast shows effects from the releases at Building 36. Further investigations will delineate the extent of impacted soils.

7.0 REFERENCE LIST

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COMPREHENSIVE LIST OF ABBREVIATIONS AND ACRONYMS FOR RESULTS OF ANALYTICAL DATA TABLES

McDonnell Douglas Realty Company
C-6 Facility, Los Angeles, California

SA-NW	= Supplemental Area Northwest
SA-NE	= Supplemental Area Northeast
mg/kg	= milligrams per kilogram
mg/L	= milligrams per liter
µg/kg	= micrograms per kilogram
ppm	= parts per million
ft bgs	= feet below ground surface
TTLC	= Total Threshold Limit Concentration
STLC	= Soluble Threshold Limit Concentration
TRPH	= total recoverable petroleum hydrocarbons
TPH-E Diesel	= total petroleum hydrocarbons (EPA Method 8015 modified for diesel)
TPH-E Motor Oil	= total petroleum hydrocarbons (EPA Method 8015 modified for motor oil)
PCB	= polychlorinated biphenyls

TABLE 1
SOIL SAMPLING ANALYTICAL PROGRAM FOR PARCEL A

McDonnell Douglas Realty Company
C-6 Facility, Los Angeles, California

Area	Location	Sample I D	# of subsurface samples	8260 or 8010/8020	418.1	8015M[1]	Title 22 Metals	Cr (VI)[2]	8270	8080 (PCBs)	8080 (Pesticides)	9045 pH	9010 Cyanide	900/901.1 RAD	Physical Analysis
1	Building 40	2BB-1-1-(1,4,10,15,20,25)	6	6	6	6	6		6						
1	Building 40	2BB-1-1A-(1,4,10)	3	3	3	3	3		3						
1	Building 40	2BB-1-2-(1,4,10)	3	3	3		3		3						
1	Building 41	2BB-1-3-(1,4,10)	3	3	3	1	3	3	3						
1	Building 41	2BB-1-4-(1,4,10,20,30,40,50)	7	7	7	1	7	7	7						
1	Building 41	2BB-1-5-(1,4,10,20,30,40,50)	7	7	7	1	7	7	7						
1	Building 41	2BB-1-6-(1,4,10,20,30,40,50)	7	7	7	1	7	7	7						
1	Building 45	2BB-1-7-(1,5,10)	3	3	3	2	3	3	3				3		
1	Building 45	2BB-1-8-(1,4,10)	3	3	3	2	3	3	3				3		
1	Building 45	2BB-1-9-(1,4,10)	3	3	3	1	3	3	3				3		
1	Building 45	2BB-1-10-(1,4,10)	3	3	3	1	3	3	3						
1	Building 45	2BB-1-11-(1,4,10)	3	3	3	2	3	3	3						
1	Building 66-1	2BB-1-12-(1,4,10)	3	3	3	1	3	3	3				3		
1	Building 66-1	2BB-1-13-(1,4,10)[3]	1	1	1	1	1	1	1				1		
1	Cr Recovery System Area	2BB-1-14-(1,4,10,15,20,25)	6	6	6	6	6	6				6			
1	Cr Recovery System Area	2BB-1-15-(1,4,10,15,20,25)	6	6	6	6	6	6				6			
1	Cr Recovery System Area	2BB-1-16-(1,4,10,15,20,25)	6	6	6	6	6	6				6			
1	Cr Recovery System Area	2BB-1-17-(1,4,10,15,20,25)	6	6	6		6	6				6			
1	Cr Recovery System Area	2BB-1-18-(1,4,10,15,20,25)	6	6	6	6	6	6				6			
1	Chemical Etching Area	2BB-1-19-(1,4,10,15,20,25)	6	6	6	2	6	6				6			
1	Chemical Etching Area	2BB-1-20-(1,4,10,15,20,25)	6	6	6	2	6	6				6			
1	Chemical Etching Area	2BB-1-21-(1,4,10,15,20,25)	6	6	6	1	6	6				6			
1	Chemical Etching Area	2BB-1-22-(1,4,10,15,20,25)	6	6	6		6	6				6			
1	Area SE of Building 41	2BB-1-23-(1,4,10,20,30,40,50)	7	7	7		7	7							
1	Area SE of Building 41	2BB-1-24-(1,4,10,20,30,40,50)	7	7	7		7	7							
1	Area SE of Building 41	2BB-1-25-(1,4,10,20,30,40,50)	7	7	7		7	6							
1	Area SE of Building 41	2BB-1-26-(1,4,10,20,30,40,50)	7	7	7	1	7	7							3

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TABLE 1
SOIL SAMPLING ANALYTICAL PROGRAM FOR PARCEL A

McDonnell Douglas Realty Company
C-6 Facility, Los Angeles, California

Area	Location	Sample I D	# of subsurface samples	8260 or 8010/8020	418.1	8015M[1]	Title 22 Metals	Cr (VI)[2]	8270	8080 (PCBs)	8080 (Pesticides)	9045 pH	9010 Cyanide	900/901.1 RAD	Physical Analysis
1	Open Area of AREA 1	2BB-1-27-(1,4,10)	3	3	3	2	3	3	3						
1	Open Area of AREA 1	2BB-1-27A-(1,4,10)	3	3	3		3	3							
1	Open Area of AREA 1	2BB-1-27B-(1,4,10)	3	3	3		3	3							
1	Open Area of AREA 1	2BB-1-28-(1,4,10)	3	3	3	2	3	3	3						
1	Open Area of AREA 1	2BB-1-29-(1,4,10)	3	3	3	2	3	3	3						
1	Open Area of AREA 1	2BB-1-30-(1,4,10)	3	3	3	2	3	3	3						
1	Open Area of AREA 1	2BB-1-31-(1,4,10)	3	3	3	1	3	3	3						
1	Open Area of AREA 1	2BB-1-32-(1,4,10)	3	3	3	1	3	3	3						
1	Open Area of AREA 1	2BB-1-33-(1,4,10)	3	3	3		3	3	3						
1	Open Area of AREA 1	2BB-1-34-(1,4,10)	3	3	3	1	3	3	3				3		
1	Open Area of AREA 1	2BB-1-35-(1,4,10)	3	3	3		3	3	3				3		
1	Open Area of AREA 1	2BB-1-36-(1,4,10)	3	3	3		3	3	3						
1	Open Area of AREA 1	2BB-1-37-(1,4,10)	3	3	3	1	2	2	2				2		
1	Open Area of AREA 1	2BB-1-38-(1,4,10,20,30,40,50)	7	7	7		7	6	7			7			
1A	Parking area bordered ILM	2BB-1A-1-(1,4,10,20,30,40,50)	7	7	7		7	7		7					
1A	Parking area bordered ILM	2BB-1A-2-(1,4,10,20,30,40,50)	7	7	7		7	7		7					
1A	Parking area bordered ILM	2BB-1A-3-(1,4,10,20,30,40,50)	7	7	7		7	7		7					
1A	Parking area bordered ILM	2BB-1A-4-(1,4,10,20,30,40,50)	7	7	7		7	7		7					
1A	Parking area bordered ILM	2BB-1A-5-(1,4,10,20,30,40,50)	7	7	7		7	7		7					
1A	Parking area bordered ILM	2BB-1A-5A-(4,10,20,30,40,50)	6	6	6		6	3		6					3
1A	Parking area bordered ILM	2BB-1A-6-(4,10,20,30,40,50)	6	6	6		6	4		6					
1A	Parking area bordered ILM	2BB-1A-7-(4,10,20,30,40,50)	6	6	6		6	5		6					
1A	Parking area bordered ILM	2BB-1A-8-(1,4,10,15,20,25)	6	6	6	3	6	6		6					
1A	Parking area bordered ILM	2BB-1A-9-(1,4,10,15,20,25)	6	6	6	3	6	6		6	1				
1A	Parking area bordered ILM	2BB-1A-10-(1,4,10,15,20,25)	6	6	6	2	6	6		6					
1A	Parking area bordered ILM	2BB-1A-11-(1,4,10,15,20,25)	6	6	6	3	6	6		6					
1A	Parking area bordered ILM	2BB-1A-12-(1,4,10,15,20,25)	6	6	6		6	6		6					
1A	Parking area bordered ILM	2BB-1A-13-(1,4,10,15,20,25)	6	6	6	2	6	6		6					
1A	Parking area bordered ILM	2BB-1A-14-(1,4,10,15,20,25)	6	6	6		6	6		6					
1A	Parking area bordered ILM	2BB-1A-15-(1,4,10,15,20,25)	6	6	6		6	6		6					

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TABLE 1
SOIL SAMPLING ANALYTICAL PROGRAM FOR PARCEL A

McDonnell Douglas Realty Company
C-6 Facility, Los Angeles, California

Area	Location	Sample I D	# of subsurface samples	8260 or 8010/8020	418.1	8015M[1]	Title 22 Metals	Cr (VI)[2]	8270	8080 (PCBs)	8080 (Pesticides)	9045 pH	9010 Cyanide	900/901.1 RAD	Physical Analysis
1A	Parking area bordered ILM	2BB-1A-16-(1,4,10,15,20,25)	6	6	6	1	6	6		6					
1A	Parking area bordered ILM	2BB-1A-17-(1,4,10,20,30,40,50)	7	7	7	1	7	6		7					3
1A	Parking area bordered ILM	2BB-1A-18-(1,4,10,15,20,25)	6	6	6		6	6		6					
1A	Parking area bordered ILM	2BB-1A-19-(1,4,10,15,20,25)	6	6	6		6	6		6					
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-1-(1,5)	2	2	2		2	2	2	2		2			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-2-(4,10)	2	3	2	1	2	2	2	2		2			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-3-(1,4,10)	3	3	3	2	3	3	3	3		3			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-4-(1,4,10)	3	3	3	1	3	3				3			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-5-(4,6,10)	3	3	3		3	3				3			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-6-(4,10)	2	2	2		2	2				2			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-7-(1,4,10,20,30,40,50)	7	7	7		7					7			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-8-(1,4,8)	3	3	3		3	3				3			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-9-(4,10)	2	2	2		2	2				2			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-10-(4,10)	2	2	2		2	2				2			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-11-(1,4,10)	3	3	3		3	3				3			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-12-(4,10)	2	2	2		2	2				2			
SA-NW	Bldgs 34,57,61,67 area	2BB-SA-NW-13-(1,4,10)	3											3	
36	Building 36	2BB-36-1-(10,15,20,25)	4	4	4										
36	Building 36	2BB-36-2-(4,10,15,20,25)	5	5	5	1									
36	Building 36	2BB-36-3-(1,4,10,15,20,25)	6		6	1									
36	Building 36	2BB-36-4-(4,10,15,20,25)	5	5	5										
36	Building 36	2BB-36-5-(4,10)	2	2	2	1									
36	Building 36	2BB-36-6-(1,4,10,15,20,25,30,35)	8	8	8	6									
36	Building 36	2BB-36-7-(1,4,10,15,20,25)	6	6	6	1									
36	Building 36	2BB-36-8-(1,4,10,15,20,25)	6	6	6										
36	Building 36	2BB-36-9-(1,4,10,15,20,25)	6	6	6										
36	Building 36	2BB-36-10-(1,4,10,15,20,25)	6	6	6	1									
36	Building 36	2BB-36-11-(1,4,10,15,20,25)	6	6	6	1									
36	Building 36	2BB-36-12-(1,4,10,15,20,25)	6	6	6										
36	Building 36	2BB-36-13-(2,5,9,19,29,39,49)	7	7	7										

TABLE 1
SOIL SAMPLING ANALYTICAL PROGRAM FOR PARCEL A

McDonnell Douglas Realty Company
C-6 Facility, Los Angeles, California

Area	Location	Sample I D	# of subsurface samples	8260 or 8010/8020	418.1	8015M[1]	Title 22 Metals	Cr (VI)[2]	8270	8080 (PCBs)	8080 (Pesticides)	9045 pH	9010 Cyanide	900/901.1 RAD	Physical Analysis
36	Building 36	2BB-36-14-(4,10,20,30,40,50)	6	6	6	4									
36	Building 36	2BB-36-15-(4,10,15,20,25)	5	5	5										
36	Building 36	2BB-36-16-(1,4,10,15,20,25)	6	6	6	1									
36	Building 36	2BB-36-17-(1,4,10,15,20,25)	6	6	6										
SA-NE	Diesel fuel line area	2BB-SA-NE-1-(1,4,10,15,20,25)	6	6	6				6						
SA-NE	Diesel fuel line area	2BB-SA-NE-2-(1,4,10,20,30,40,50)	7	7	7				7						
SA-NE	Diesel fuel line area	2BB-SA-NE-3-(1,4,10,15,20,25)	6	6	6				6						
SA-NE	Diesel fuel line area	2BB-SA-NE-4-(1,4,10,15,20,25)	6	6	6				6						
SA-NE	NE unpaved area	2BB-SA-NE-5-(1,4,10,15,20,25)	6	6	6		6	6	6						
SA-NE	NE unpaved area	2BB-SA-NE-6-(1,4,10,15,20,25)	5	5	5		5	5	5						
SA-NE	NE unpaved area	2BB-SA-NE-7-(1,4,10,15,20,25)	6	6	6	1	6	6	6						
SA-NE	NE unpaved area	2BB-SA-NE-8-(1,4,10,20,30,40,50)	7	7	7	1	7	7	7						3
SA-NE	NE unpaved area	2BB-SA-NE-9-(1,4,10,15,20,25)	6	6	6		6	6	6						
SA-NE	NE unpaved area	2BB-SA-NE-10-(1,4,10,15,21,25)	6	6	6	1	6	6	6						
SA-NE	NE unpaved area	2BB-SA-NE-11-(1,4,10,15,20,25)	6	6	6	2	6	6	6						
SA-NE	NE unpaved area	2BB-SA-NE-12-(1,4,10,15,20,25)	6	6	6	1	6	6	6						
SA-NE	NE unpaved area	2BB-SA-NE-13-(1,4,10,15,20,25)	6	6	6		6	6	6						
SA-NE	NE unpaved area	2BB-SA-NE-14-(1,4,6,10,15,20,25)	7	7	7	2	7	7	7						
SA-NE	NE unpaved area	2BB-SA-NE-15-(1,4,10,15,20,25)	6	6	6		6	6	6						
SA-NE	NE unpaved area	2BB-SA-NE-16-(1,4,10)	3	3	3		3	3	3						
SA-NE	NE unpaved area	2BB-SA-NE-17-(1,4,10,15,20,25)	6	6	6										

NOTES:

Blank (empty) cell indicates analysis was not performed for the given sample.

(1) 8015M analysis was only performed on sampes with a TRPH detection in 418.1.

(2) $CR^{(VI)}$ analysis was only performed on samples with >10 mg/kg total Chromium.

(3) 2BB-1-13 hit refusal at 2.5 feet below ground surface. Only one sample was collected.